## ETSI TS 138 133 V15.6.0 (2019-07)



5G;

NR;

Requirements for support of radio resource management (3GPP TS 38.133 version 15.6.0 Release 15)



# Reference RTS/TSGR-0438133vf60 Keywords 5G

#### **ETSI**

650 Route des Lucioles F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C Association à but non lucratif enregistrée à la Sous-Préfecture de Grasse (06) N° 7803/88

#### Important notice

The present document can be downloaded from: <u>http://www.etsi.org/standards-search</u>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at <a href="https://www.etsi.org/deliver">www.etsi.org/deliver</a>.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at <a href="https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx">https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx</a>

If you find errors in the present document, please send your comment to one of the following services: https://portal.etsi.org/People/CommiteeSupportStaff.aspx

#### **Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2019. All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M<sup>™</sup> logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

**GSM**® and the GSM logo are trademarks registered and owned by the GSM Association.

## Intellectual Property Rights

#### **Essential patents**

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

#### **Trademarks**

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

## Legal notice

This Technical Specification (TS) has been produced by the ETSI 3<sup>rd</sup> Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <a href="http://webapp.etsi.org/key/queryform.asp">http://webapp.etsi.org/key/queryform.asp</a>.

## Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the <u>ETSI Drafting Rules</u> (Verbal forms for the expression of provisions).

"must" and "must not" are NOT allowed in ETSI deliverables except when used in direct citation.

## Contents

Intelle	ectual Property Rights	2
Legal	notice	2
Moda	al verbs terminology	2
Forew	vord	17
1	Scope	18
2	References	
3	Definitions, symbols and abbreviations	
3.1	Definitions	
3.2	Symbols	
3.3	Abbreviations	
3.4	Test tolerances.	
3.5	Frequency bands grouping	
3.5.1	Introduction	
3.5.2	NR operating bands in FR1	
3.5.3	NR operating bands in FR2	
3.6	Applicability of requirements in this specification version	
3.6.1	RRC connected state requirements in DRX	
3.6.2	Number of serving carriers	
3.6.2.1	<u> </u>	
3.6.2.2		
3.6.2.3		
3.6.2.4	Č	
3.6.2 3.6.3	Applicability for intra-band FR2	
3.6.4	Applicability for FR2 UE power classes	
3.6.5	Applicability for SDL bands	
3.6.6	Applicability of requirements for NGEN-DC operation	
3.0.0		
4	SA: RRC_IDLE state mobility	
4.1	Cell Selection	
4.2	Cell Re-selection	-
4.2.1	Introduction	
4.2.2	Requirements	
4.2.2.1		
4.2.2.5		
4.2.2.6		
4.2.2.7	7 General requirements	30
5	SA: RRC_INACTIVE state mobility	31
5.1	Cell Re-selection	
5.1.1	Introduction	
5.1.2	Requirements	
5.1.2.1	•	
5.1.2.2	± · · ·	
5.1.2.3		
5.1.2.4		
5.1.2.5	± •	
5.1.2.6		
5.1.2.7	1 100 1	
5.2	RRC_INACTIVE Mobility Control	
6	RRC_CONNECTED state mobility	
6.1	Handover	
6.1.1	NR Handover	
6.1.1 6.1.1.1		
6.1.1.2		
U.1.1.4	- 1410 1 101 1 101 1 101 1 101 1 101 100 1	J

6.1.1.2.1	Handover delay	32
6.1.1.2.2	Interruption time	
6.1.1.3	NR FR2- NR FR1 Handover	
6.1.1.3.1	Handover delay	
6.1.1.3.2	Interruption time	
6.1.1.4	NR FR2- NR FR2 Handover	
6.1.1.4.1		
	Handover delay	
6.1.1.4.2	Interruption time	
6.1.1.5	NR FR1- NR FR2 Handover	
6.1.1.5.1	Handover delay	
6.1.1.5.2	Interruption time	35
6.1.2	NR Handover to other RATs	36
6.1.2.1	NR – E-UTRAN Handover	36
6.1.2.1.1	Introduction	36
6.1.2.1.2	Handover delay	
6.1.2.1.3	Interruption time	
6.2	RRC Connection Mobility Control.	
6.2.1	SA: RRC Re-establishment	
6.2.1.1	Introduction	
6.2.1.1		
	Requirements	
6.2.1.2.1	UE Re-establishment delay requirement	
6.2.2	Random access	
6.2.2.1	Introduction	
6.2.2.2	Requirements	
6.2.2.2.1	Contention based random access	38
6.2.2.2.2	Non-Contention based random access	39
6.2.2.2.3	UE behaviour when configured with supplementary UL	40
6.2.3	SA: RRC Connection Release with Redirection	
6.2.3.1	Introduction	
6.2.3.2	Requirements	
62321	RRC connection release with redirection to NR	ΔΙ
6.2.3.2.1	RRC connection release with redirection to NR	
6.2.3.2.1 6.2.3.2.2	RRC connection release with redirection to NRRRC connection release with redirection to E-UTRAN	
6.2.3.2.2	RRC connection release with redirection to E-UTRAN	41
6.2.3.2.2	RRC connection release with redirection to E-UTRAN ming	41 42
6.2.3.2.2 7 Ti 7.1	RRC connection release with redirection to E-UTRAN ming UE transmit timing	41 42 42
6.2.3.2.2 7 Ti 7.1 7.1.1	RRC connection release with redirection to E-UTRAN ming UE transmit timing Introduction	
6.2.3.2.2 7 Ti 7.1 7.1.1 7.1.2	RRC connection release with redirection to E-UTRAN	
6.2.3.2.2  7 Ti 7.1 7.1.1 7.1.2 7.1.2.1	RRC connection release with redirection to E-UTRAN	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction	
6.2.3.2.2 7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Requirements	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Timing advance	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Timing advance  Introduction.	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Timing advance	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Timing advance  Introduction.	
6.2.3.2.2  7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Timing advance  Introduction.  Requirements  Timing advance  Introduction.  Requirements	41 42 42 42 43 43 44 44 44 45 45
6.2.3.2.2 7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy	41 42 42 42 43 43 44 44 44 45 45 45
6.2.3.2.2 7 Ti 7.1. 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy	
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition	
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements	41 42 42 42 43 44 44 44 45 45 45 45 45
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements  Maximum Transmission Timing Difference	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements  Maximum Transmission Timing Difference  Introduction	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements  Maximum Transmission Timing Difference  Introduction  Maximum Transmission Timing Difference  Introduction  Minimum Requirements for inter-band EN-DC	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1. 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction.  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction.  Requirements  Timing advance  Introduction.  Requirements  Timing Advance adjustment delay.  Timing Advance adjustment accuracy  Cell phase synchronization accuracy.  Definition.  Minimum requirements.  Maximum Transmission Timing Difference  Introduction.  Minimum Requirements for inter-band EN-DC  Minimum Requirements for intra-band EN-DC	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1. 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements  Maximum Transmission Timing Difference  Introduction  Minimum Requirements for inter-band EN-DC  Minimum Requirements for intra-band EN-DC  Minimum Requirements for NR Carrier Aggregation	41 42 42 42 43 44 44 44 45 45 45 45 45 46 46
6.2.3.2.2 7 Ti 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4 7.5.5	RRC connection release with redirection to E-UTRAN	41 42 42 42 43 44 44 44 45 45 45 45 45 45 45 45 45 46 46
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4 7.5.5 7.5.6	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements  Maximum Transmission Timing Difference  Introduction  Minimum Requirements for inter-band EN-DC  Minimum Requirements for NR Carrier Aggregation  Minimum Requirements for inter-band NE-DC	41 42 42 42 43 44 44 44 45 45 45 45 45 45 45 45 45 45
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4 7.5.5 7.5.6 7.6	RRC connection release with redirection to E-UTRAN  ming  UE transmit timing  Introduction  Requirements  Gradual timing adjustment  One shot timing adjustment  UE timer accuracy  Introduction  Requirements  Timing advance  Introduction  Requirements  Timing Advance adjustment delay  Timing Advance adjustment accuracy  Cell phase synchronization accuracy  Definition  Minimum requirements  Maximum Transmission Timing Difference  Introduction  Minimum Requirements for inter-band EN-DC  Minimum Requirements for inter-band NB-DC  Minimum Requirements for inter-band NB-DC	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4 7.5.5 7.5.6 7.6 7.6.1	RRC connection release with redirection to E-UTRAN	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4 7.5.5 7.5.6 7.6 7.6.1 7.6.2	RRC connection release with redirection to E-UTRAN	41  42  42  43  44  44  44  45  45  45  45  45  45
6.2.3.2.2 7 Ti 7.1.1 7.1.1 7.1.2.1 7.1.2.1 7.1.2.2 7.2 7.2.1 7.2.2 7.3 7.3.1 7.3.2 7.3.2.1 7.3.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1 7.5.2 7.5.3 7.5.4 7.5.5 7.5.6 7.6 7.6.1	RRC connection release with redirection to E-UTRAN	41  42  42  43  44  44  44  45  45  45  45  45  45

7.6.5	Minimum Requirements for inter-band NE-DC	
7.6.6	Minimum Requirements for inter-band NR DC	
7.7	deriveSSB-IndexFromCell tolerance	
7.7.1	Minimum requirements	
7.8	Void	51
8 .	Signalling characteristics	51
8.1	Radio Link Monitoring	
8.2	Interruption	
8.2.1.2	Requirements	
8.2.1.2.	1	
8.2.1.2.		
8.2.1.2.		
8.2.1.2.	· · · · · · · · · · · · · · · · · · ·	
8.2.2.2.		
8.2.2.2.		
8.2.2.2.	•	
8.2.2.2.		
8.2.3	NE-DC Interruptions	
8.2.3.1	Introduction	69
8.2.3.2	Requirements	70
8.2.3.2.		
8.2.3.2.	Interruptions at PSCell/SCell addition/release	70
8.2.3.2.	6 Interruptions at UL carrier RRC reconfiguration	73
8.2.3.2.	7 Interruption due to Active BWP switching Requirement	73
8.2.4	NR-DC: Interruptions	73
8.2.4.1	Introduction	73
8.2.4.2	Requirements	
8.2.4.2.	1	
8.2.4.2.	1	
8.2.4.2.		
8.2.4.2.		
8.3	SCell Activation and Deactivation Delay	
8.3.1	Introduction	
8.3.2	SCell Activation Delay Requirement for Deactivated SCell	
8.3.3	SCell Deactivation Delay Requirement for Activated SCell	
8.4	UE UL carrier RRC reconfiguration Delay	
8.4.1	Introduction	
8.4.2	UE UL carrier configuration Delay Requirement	
8.4.3	UE UL carrier deconfiguration Delay Requirement	
8.6	Active BWP switch delay	
8.6.1	Introduction	
8.6.2	DCI and timer based BWP switch delay	
8.6.3 8.7	RRC based BWP switch delay	
8.7 8.8	Void	
8.8 8.8.1	NE-DC: E-UTRAN PSCell Addition and Release Delay	
8.8.2	E-UTRAN PSCell Addition Delay Requirement	
8.8.3	E-UTRAN PSCell Release Delay Requirement	
8.10	Active TCI state switching delay	
8.10.1	Introduction	
8.10.1	Known conditions for TCI state	
8.10.2	MAC-CE based TCI state switch delay	
8.10.4	DCI based TCI switch delay	
8.10.5	RRC based TCI state delay	
8.10.6	Active TCI state list update delay	
	Measurement Procedure	
9.1	General measurement requirement	
9.1.1	Introduction	
9.1.2	Measurement gap	
9.1.2.1	EN-DC: Measurement Gap Sharing	102

9.1.2.1a	SA: Measurement Gap Sharing	.103
9.1.2.1b	NE-DC: Measurement Gap Sharing	.103
9.1.2.1c	NR-DC: Measurement Gap Sharing	.104
9.1.3	UE Measurement capability	.105
9.1.3.1	EN-DC: Monitoring of multiple layers using gaps	.105
9.1.3.1b	NE-DC: Monitoring of multiple layers using gaps	
9.1.3.2	EN-DC: Maximum allowed layers for multiple monitoring	.106
9.1.3.2a	SA: Maximum allowed layers for multiple monitoring	.107
9.1.3.2b	NE-DC: Maximum allowed layers for multiple monitoring	.107
9.1.4	Capabilities for Support of Event Triggering and Reporting Criteria	.108
9.1.4.1	Introduction	.108
9.1.4.2	Requirements	.109
9.1.5	Carrier-specific scaling factor	.110
9.1.5.1	Monitoring of multiple layers outside gaps	.110
9.1.5.1.1	EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed outside	
	gaps	.111
9.1.5.1.2	SA mode: carrier-specific scaling factor for SSB-based measurements performed outside	
	gaps without NR-DC operation	.111
9.1.5.1.3		
	gaps with NR-DC operation	.112
9.1.5.2	Monitoring of multiple layers within gaps	
9.1.5.2.1	EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed within	
	gaps	.112
9.1.5.2.2		
9.1.5.2.3		
9.1.5.2.4	·	
9.1.6	Minimum requirement at transitions	
9.2	NR intra-frequency measurements	
9.2.1	Introduction.	
9.2.2	Requirements applicability	
9.2.3	Number of cells and number of SSB	
9.2.4	Measurement Reporting Requirements	
9.2.5	Intrafrequency measurements without measurement gaps	
9.2.5.3.1	Scheduling availability of UE performing measurements in TDD bands on FR1	
9.2.5.4	SFTD Measurements between PCell and PSCell	.123
9.2.5.4.1	Introduction	
9.2.5.4.2		
9.2.5.4.3	· · · · · · · · · · · · · · · · · · ·	
9.2.6	Intrafrequency measurements with measurement gaps	
9.3	NR inter-frequency measurements	
9.3.2	Requirements applicability	
9.3.2.1	Void	
9.3.2.2	Void	
9.3.3	Number of cells and number of SSB	
9.3.4	Inter frequency cell identification	
9.3.4.1	Void	
9.3.4.2	Void	
9.3.5	Inter frequency measurements	
9.3.5.1	Void	
9.3.5.2	Void	
9.3.5.3	Void	
9.3.6	NR Inter frequency measurements reporting requirements	
9.3.7	Void	
9.3.7 9.4	Inter-RAT measurements	
9. <del>4</del> 9.4.1	Introduction	
9.4.1 9.4.2	NR – E-UTRAN FDD measurements	
9.4.2 9.4.3	NR – E-UTRAN TDD measurements	
9.4.3 9.4.4	Inter-RAT RSTD measurements	
9.4.4 9.4.5	Inter-RAT E-CID measurements	
10 M	Ieasurement Performance requirements	.154
10.2	F-UTRAN measurements	185

10.2.1	Introduction	185
10.2.2	E-UTRAN RSRP measurements	
10.2.3	E-UTRAN RSRQ measurements	185
10.2.4	E-UTRAN RSTD measurements	186
10.2.5	E-UTRAN RS-SINR measurements	186
11 M	easurements Performance Requirements for NR network	186
Annex A	(normative): Test Cases	187
	irpose of annex	
	equirement classification for statistical testing	
A.2.1	Types of requirements in TS 38.133	
A.2.1.1	Time and delay requirements on UE higher layer actions	
A.2.1.2 A.2.1.3	Measurements of power levels, relative powers and time	
A.2.1.3 A.2.1.4	Implementation requirements	
	RM test configurations	
A.3.1	Reference measurement channels	
A.3.1.1	PDSCH	
A.3.1.1.1 A.3.1.1.2	FDD.	
A.3.1.1.2 A.3.1.2	TDD CORESET for RMSI scheduling	
A.3.1.2.1	FDD	
A.3.1.2.1 A.3.1.2.2	TDD	
A.3.1.2.2 A.3.1.3	CORESET for RMC scheduling	
A.3.1.3.1	FDD	
A.3.1.3.2	TDD	
A.3.1.4	TDD UL/DL configuration	
A.3.2	OFDMA channel noise generator (OCNG)	
A.3.2.1	Generic OFDMA Channel Noise Generator (OCNG)	
A.3.2.1.1	OCNG pattern 1: Generic OCNG pattern for all unused REs	202
A.3.2.1.2	OCNG pattern 2: Generic OCNG pattern for all unused REs for 2AoA setup	202
A.3.2.2	Void	
A.3.3	Reference DRX configurations	
A.3.3.1	DRX Configuration 1: DRX cycle = 40 ms and TAT = 500 ms	
A.3.3.2	DRX Configuration 2: DRX cycle = 640 ms and TAT = 500 ms	
A.3.3.3	DRX Configuration 3: DRX cycle = 40 ms and TAT = Infinity	
A.3.3.4	DRX Configuration 4: DRX cycle = 160 ms and TAT = Infinity	
A.3.3.7	DRX Configuration 7: DRX cycle = 640 ms and TAT = Infinity	
A.3.3.8	DRX Configuration 8: DRX cycle = 320 ms and TAT = Infinity	
A.3.3.9	DRX Configuration 9: DRX cycle = 40 ms and TAT = 500 ms	
A.3.3.10 A.3.4	DRX Configuration 10: DRX cycle = 640 ms  Test Cases with Different Channel Bandwidths	
A.3.4.1	Test Cases with Different E-UTRA Channel Bandwidths	
A.3.4.1.1	Introduction	
A.3.4.1.1	Principle of testing	
A.3.5	Test Cases for Synchronous and Asynchronous DC Operations	
A.3.5.1	EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations	
A.3.5.1.1	Introduction	
A.3.5.1.2	Principle of Testing	
A.3.6	Antenna configurations	
A.3.6.2	Antenna configurations for FR2	
A.3.7	EN-DC test setup	
A.3.7.1	Introduction	209
A.3.7.2	E-UTRAN Serving Cell Parameters	
A.3.7.2.1	E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1	
A.3.7.2.2	E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2	
A.3.8	PRACH configurations	
A.3.8.1	Introduction	
A 3 8 2	PRACH configurations in FR1	211

A.3.8.2.1	FR1 PRACH configuration 1	211
A.3.8.2.2	FR1 PRACH configuration 2	212
A.3.8.2.3	FR1 PRACH configuration 3	213
A.3.8.2.4	FR1 PRACH configuration 4	214
A.3.8.3	PRACH configurations in FR2	215
A.3.8.3.1	FR2 PRACH configuration 1	215
A.3.8.3.2	FR2 PRACH configuration 2	
A.3.8.3.3	FR2 PRACH configuration 3	
A.3.8.3.4	FR2 PRACH configuration 4	218
A.3.9	BWP configurations	
A.3.9.1	Introduction	
A.3.9.2	Downlink BWP configurations	
A.3.9.2.1	Initial BWP	
A.3.9.2.2	Dedicated BWP	
A.3.9.3	Uplink BWP configurations	
A.3.9.3.1	Initial BWP	
A.3.9.3.2	Dedicated BWP	
A.3.10	SSB Configurations	
A.3.10.1	SSB Configurations for FR1	
A.3.10.1.1		
A.3.11	SMTC Configurations	
A.3.11.1	SMTC pattern 1: SMTC period = 20 ms with SMTC duration = 1 ms	
A.3.11.2	SMTC pattern 2: SMTC period = 20 ms with SMTC duration = 5 ms	
A.3.11.3	SMTC pattern 3: SMTC period = 160 ms with SMTC duration = 1 ms	
A.3.12	Test Cases with Different CC Configurations	
	EN-DC Test Cases with Different EN-DC Configurations	
A.3.12.11	e e e e e e e e e e e e e e e e e e e	
A.3.12.1.2		
A.3.12.1.2 A.3.12.2	Carrier Aggregation Test Cases with Different CA Configurations	
A.3.12.2.		
A.3.12.2.2		
A.3.12.2.2	Test Cases in SA and EN-DC Operations	
A.3.13.1	Introduction	
A.3.13.1 A.3.13.2	Principle of Testing	
A.3.14	CSI-RS configurations	
A.3.14.1	FDD	
A.3.14.1 A.3.14.2	TDD	
A.3.14.2 A.3.15	Angle of Arrival (AoA) for FR2 RRM test cases	
A.3.15.1		
A.3.15.1 A.3.15.2	Setup 1: Single AoA in non By beam peak direction	
	Setup 2: Single AoA in non Rx beam peak direction	
A.3.15.2.1		
A.3.15.2.2		
A.3.15.3	Setup 3: 2 AoAs	
A.3.16	TCI State Configuration	
A.3.16.1	Introduction	
A.3.16.2	TCI states	
A.3.17	Configurations of CSI-RS for tracking.	
A.3.17.1	Configuration of CSI-RS for tracking for FR1	
A.3.17.1.1		
A.3.17.1.2		
A.3.17.2	Configuration of CSI-RS for tracking for FR2	
A.3.17.2.1	1 TDD	235
A.4 EN	N-DC tests with all NR cells in FR1	236
A.4.1	Void	
A.4.2	Void	
A.4.3	RRC_CONNECTED state mobility	
A.4.3.1	Void	
A.4.3.1 A.4.3.2	RRC Connection Mobility Control	
A.4.3.2.1	Void	
A.4.3.2.1 A.4.3.2.3	Void	
A.4.3.2.3 A 4 4	Timing	243
	1.00002	

A.4.4.1	UE transmit timing	.243
A.4.4.1.1	NR UE Transmit Timing Test for FR1	
A.4.4.1.1.1	Test Purpose and environment	
A.4.4.1.1.2	Test requirements	
A.4.4.2	UE timer accuracy	.246
A.4.4.3	Timing advance	
A.4.4.3.1	EN-DC FR1 timing advance adjustment accuracy	.246
A.4.4.3.1.1	Test Purpose and Environment	.246
A.4.4.3.1.2	Test Parameters	.246
A.4.4.3.1.3	Test Requirements	.248
A.4.5 Si	gnaling characteristics	
A.4.5.1	Radio link Monitoring	.249
A.4.5.1.1	Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in	
	non-DRX mode	
A.4.5.1.1.1	Test Purpose and Environment	
A.4.5.1.1.2	Test Requirements	.252
A.4.5.1.2	Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in	
	non-DRX mode	
A.4.5.1.2.1	Test Purpose and Environment	
A.4.5.1.2.2	Test Requirements	.255
A.4.5.1.3	Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in	
	DRX mode	
A.4.5.1.3.1	Test Purpose and Environment	
A.4.5.1.3.2	Test Requirements	.259
A.4.5.1.4	Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in	
	DRX mode	
A.4.5.1.4.1	Test Purpose and Environment	
A.4.5.1.4.2	Test Requirements	
A.4.5.2	Interruption	.276
A.4.5.2.1	E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in	27.
	synchronous EN-DC	
A.4.5.2.1.1	Test Purpose and Environment	
A.4.5.2.1.2	Test Requirements	.278
A.4.5.2.2	E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in	270
A 45001	asynchronous EN-DC	
A.4.5.2.2.1 A.4.5.2.2.2	Test Parising and Environment	
A.4.5.2.2 A.4.5.2.3	Test Requirements  E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in	.201
A.4.3.2.3		202
A.4.5.2.3.1	synchronous EN-DC  Test Purpose and Environment	202
A.4.5.2.3.1 A.4.5.2.3.2	Test Requirements	
A.4.5.2.4	E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in	.204
A.4.3.2.4	asynchronous EN-DC	285
A.4.5.2.5	E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in	.20.
A.4.3.2.3		.288
A.4.5.2.6	E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in	.200
11.4.3.2.0	asynchronous EN-DC	291
A.4.5.2.7	Void	
A.4.5.4	UE UL carrier RRC reconfiguration Delay	
A.4.5.4.1	UE UL carrier RRC reconfiguration Delay	
	est Purpose and Environment	
A.4.5.4.1.2	Test Requirements	
A.4.5.5	Beam Failure Detection and Link recovery procedures	
A.4.5.5.2.2	Test Requirements	
A.4.5.6	Active BWP switch delay	
A.4.5.6.1	DCI-based and Timer-based Active BWP Switch	
A.4.5.6.1.1	E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC	
A.4.5.6.1.1.1	Test Purpose and Environment	
A.4.5.6.1.1.2	<u>.</u>	
A.4.5.6.1.2	E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in	
	synchronous EN-DC	.325
A 4 5 6 1 2 1	Tast Purpose and Environment	325

A.4.5.6.1.2.2	Test Requirements	
A.4.5.6.2	RRC-based Active BWP Switch	329
A.4.5.7	PSCell addition and release delay	332
A.4.5.7.1	Addition and Release Delay of known NR PSCell	332
A.4.5.7.1.1	Test purpose and environment	
A.4.5.7.1.2	Test Requirements	
A.4.6 Me	easurement procedure	
A.4.6.1	Intra-frequency Measurements	
A.4.6.1.1	EN-DC event triggered reporting tests without gap under non-DRX	
A.4.6.1.1.1	Test purpose and Environment	
A.4.6.1.1.2	Test parameters	
A.4.6.1.1.3		
	Test Requirements	
A.4.6.1.2	EN-DC event triggered reporting tests without gap under DRX	
A.4.6.1.2.1	Test purpose and Environment	
A.4.6.1.2.2	Test parameters	
A.4.6.1.2.2	Test Requirements	
A.4.6.1.3	EN-DC event triggered reporting tests with per-UE gaps under non-DRX	
A.4.6.1.3.1	Test purpose and Environment	340
A.4.6.1.3.2	Test parameters	340
A.4.6.1.3.3	Test Requirements	342
A.4.6.1.4	EN-DC event triggered reporting tests with per-UE gaps under DRX	343
A.4.6.1.4.1	Test purpose and Environment	
A.4.6.1.4.2	Test parameters	
A.4.6.1.4.3	Test Requirements	
A.4.6.1.5	EN-DC event triggered reporting tests without gap under non-DRX with SSB index reading	
A.4.6.1.5.1	Test purpose and Environment	
A.4.6.1.5.2	Test parameters	
A.4.6.1.5.2 A.4.6.1.5.3	Test Requirements	
A.4.6.1.6	EN-DC event triggered reporting tests with SSB index reading with per-UE gaps	
A.4.6.1.6.1	Test purpose and Environment	
A.4.6.1.6.2	Test parameters	
A.4.6.1.6.3	Test Requirements	
A.4.6.2	Inter-frequency Measurements	
A.4.6.2.1	EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX	
	is not used	
A.4.6.2.1.1	Test Purpose and Environment	
A.4.6.2.1.2	Test Requirements	
A.4.6.2.2	EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX	
	is used	
A.4.6.2.2.1	Test Purpose and Environment	354
A.4.6.2.2.2	Test Requirements	
A.4.6.2.3	Void	
A.4.6.2.4	Void	
A.4.6.2.5	EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is	
11.1.0.2.3	not used	358
A.4.6.2.5.1	Test Purpose and Environment.	
A.4.6.2.5.2	<u>*</u>	
	Test Requirements	501
A.4.6.2.6	EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is	261
1 1 6 2 6 1	used	
A.4.6.2.6.1	Test Purpose and Environment	
A.4.6.2.6.2	Test Requirements	
A.4.6.2.7	Void	
A.4.6.2.8	Void	
A.4.6.3	L1-RSRP measurement for beam reporting	
A.4.6.3.1	SSB based L1-RSRP measurement when DRX is not used	
A.4.6.3.1.1	Test Purpose and Environment	
A.4.6.3.1.2	Test parameters	365
A.4.6.3.1.3	Test Requirements	
A.4.6.3.2	SSB based L1-RSRP measurement when DRX is used	
A.4.6.3.3	CSI-RS based L1-RSRP measurement when DRX is not used	
A.4.6.3.3.1	Test Purpose and Environment	
A.4.6.3.3.2	Test parameters.	368

A.4.6.3.3.3	Test Requirements	369
A.4.6.3.4	CSI-RS based L1-RSRP measurement when DRX is used	369
A.4.7 Me	asurement Performance requirements	
	SS-RSRP	
A.4.7.1.1	EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell	
A.4.7.1.1.1	Test Purpose and Environment	
A.4.7.1.1.2	Test parameters	
A.4.7.1.1.3	Test Requirements	
A.4.7.1.3	Void	
A.4.7.2	SS-RSRQ	376
A.4.7.2.1	EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell	376
A.4.7.2.1.1	Test Purpose and Environment	
A.4.7.2.1.2	Test Parameters	
A.4.7.2.1.3	Test Requirements	
A.4.7.2.2	EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell	
A.4.7.2.2.1	Test Purpose and Environment	
A.4.7.2.2.2	Test Parameters	
A.4.7.2.2.3	Test Requirements	
	SS-SINR	
A.4.7.3.1	EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell	
A.4.7.3.1.1	Test Purpose and Environment	
A.4.7.3.1.2	Test Parameters	
A.4.7.3.1.3	Test Requirements	385
A.4.7.3.2	EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell	386
A.4.7.3.2.1	Test Purpose and Environment	
A.4.7.3.2.2	Test Parameters	
A.4.7.3.2.3	Test Requirements	
	L1-RSRP measurement for beam reporting	
	L1-RSRP measurement for beam reporting	
A.4.7.4.1	SSB based L1-RSRP measurement	
A.4.7.4.1.1	Test Purpose and Environment	
A.4.7.4.1.2	Test parameters	
A.4.7.4.1.3	Test Requirements	
A.4.7.4.2	CSI-RS based L1-RSRP measurement on resource set with repetition off	
A.4.7.4.2.1	Test Purpose and Environment	
A.4.7.4.2.2	Test parameters	
A.4.7.4.2.3	Test Requirements	395
A.4.7.5	SFTD accuracy	395
A.4.7.5.1	SFTD accuracy	395
A.4.7.5.1.1	Test Purpose and Environment	
A.4.7.5.1.2	Test Parameters	
A.4.7.5.1.3	Test Requirements	
A.4.7.5.2	Void	
A.4.7.5.3	Void	
A.4.8 Vo	id	398
A.5 EN-D	C tests with one or more NR cells in FR2	398
	id	
	id	
	C_CONNECTED state mobility	
	Void	
	RRC Connection Mobility Control	
A.5.3.2.1	Void	
A.5.3.2.2	Random Access	
A.5.3.2.2.1	Contention based random access test in FR2 for PSCell/SCell in EN-DC	
A.5.3.2.2.2	Non-contention based random access test in FR2 for PSCell/SCell in EN-DC	402
A.5.3.2.3	Void	406
A.5.4 Tin	ning	
	UE transmit timing	
A.5.4.1.1	NR UE Transmit Timing Test for FR2	
A.5.4.1.1.1	Test Purpose and environment	
A.5.4.1.1.2	Test requirements	
11.J.T.1.1.4	10st requirements	+∪0

A.5.4.2	UE timer accuracy	.408
A.5.4.3	Timing advance	.408
A.5.4.3.1 EN	-DC FR2 timing advance adjustment accuracy	.408
A.5.4.3.1.1 To	est Purpose and Environment	408
A.5.4.3.1.2 To	est Parameters	.409
A.5.4.3.1.3	Test Requirements	411
A.5.5 Sig	naling characteristics	
A.5.5.1	Radio link Monitoring	
A.5.5.1.1	Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in	
	non-DRX mode	
A.5.5.1.1.1	Test Purpose and Environment	.411
A.5.5.1.1.2	Test Requirements	.415
A.5.5.1.2	Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in	
	non-DRX mode	
A.5.5.1.2.1	Test Purpose and Environment	.415
A.5.5.1.2.2	Test Requirements	.418
A.5.5.1.3	Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in	
	DRX mode	.418
A.5.5.1.3.1	Test Purpose and Environment	418
A.5.5.1.3.2	Test Requirements	.422
A.5.5.1.4	Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in	
	DRX mode	.422
A.5.5.1.4.1	Test Purpose and Environment	
A.5.5.1.4.2	Test Requirements	
A.5.5.1.8.2	Test Requirements	
A.5.5.1.9	EN-DC Radio Link Monitoring UE Scheduling Restrictions on FR2	
A.5.5.1.9.1	Test Purpose and Environment	
A.5.5.1.9.2	Test Requirements	
A.5.5.2	Interruption	
A.5.5.2.1	E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in	.437
A.J.J.2.1	synchronous EN-DC	120
A.5.5.2.1.1	· · · · ·	
	Test Purpose and Environment	
A.5.5.2.1.2	Test Requirements	.442
A.5.5.2.2	E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in	4.40
	asynchronous EN-DC	
A.5.5.2.2.1	Test Purpose and Environment	
A.5.5.2.2.2	Test Requirements	.445
A.5.5.2.3	E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in	
	synchronous EN-DC	
A.5.5.2.3.1	Test Purpose and Environment	
A.5.5.2.3.2	Test Requirements	.448
A.5.5.2.4	E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in	
	asynchronous EN-DC	.448
A.5.5.2.4.1	Test Purpose and Environment	.448
A.5.5.2.4.2	Test Requirements	.451
A.5.5.2.5	E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in	
	synchronous EN-DC	451
A.5.5.2.5.1	Test Purpose and Environment	
A.5.5.2.5.2	Test Requirements	
A.5.5.2.6	E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in	
	asynchronous EN-DC	454
A.5.5.2.6.1	Test Purpose and Environment	
A.5.5.2.6.2	Test Requirements	
A.5.5.4	UE UL carrier RRC reconfiguration Delay	
A.5.5.4 A.5.5.5	Beam Failure Detection and Link recovery procedures	
A.5.5.6	Active BWP switch delay	
	DCI-based and Timer-based Active BWP Switch	
A.5.5.6.1	E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC	
A.5.5.6.1.1	·	
A.5.5.6.1.1.1	Test Purpose and Environment	
A.5.5.6.1.1.2	Test Requirements	.484
A.5.5.6.1.2	E-UTRAN – NR PSCell FR2 DL active BWP switch with FR2 SCell in non-DRX in	105

A.5.5.6.2	RRC-based Active BWP Switch	489
A.5.5.7	PSCell addition and release delay	492
A.5.5.7.1	Addition and Release Delay of NR PSCell	492
A.5.5.7.1.1	Test purpose and environment	
A.5.5.7.1.2	Test Requirements	
A.5.6 M	leasurement procedure	
A.5.6.1	Intra-frequency Measurements	
A.5.6.1.1	EN-DC event triggered reporting test without gap under non-DRX	
A.5.6.1.1.1	Test purpose and Environment	
A.5.6.1.1.2	Test Requirements	
A.5.6.1.2	EN-DC event triggered reporting test without gap under DRX	
A.5.6.1.2.1	Test purpose and Environment	
A.5.6.1.2.2	Test Requirements	
A.5.6.1.3	EN-DC event triggered reporting test with per-UE gaps under non-DRX	
A.5.6.1.3.1	Test purpose and Environment	
A.5.6.1.3.2	Test Requirements	
A.5.6.1.4	EN-DC event triggered reporting test with per-UE gaps under DRX	
A.5.6.1.4.1	Test purpose and Environment	
A.5.6.1.4.2	Test Requirements	
A.5.6.2	Inter-frequency Measurements	
A.5.6.2.1	EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX	
	is not used	506
A.5.6.2.1.1	Test Purpose and Environment	
A.5.6.2.1.2	Test Requirements	
A.5.6.2.2	EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX	
	is used.	509
A.5.6.2.2.1	Test Purpose and Environment	
A.5.6.2.2.2	Test Requirements	
A.5.6.2.3	EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is	
	not used	512
A.5.6.2.3.1	Test Purpose and Environment	
A.5.6.2.3.2	Test Requirements	
A.5.6.2.4	EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is	
	used	515
A.5.6.2.4.1	Test Purpose and Environment	515
A.5.6.2.2.4	Test Requirements	
A.5.6.2.5	EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX	
	is not used	519
A.5.6.2.5.1	Test Purpose and Environment	519
A.5.6.2.5.2	Test Requirements	
A.5.6.2.6	EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX	
	is used	524
A.5.6.2.6.1	Test Purpose and Environment	524
A.5.6.2.6.2	Test Requirements	527
A.5.6.2.7	EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is	
	not used	528
A.5.6.2.7.1	Test Purpose and Environment	528
A.5.6.2.7.2	Test Requirements	
A.5.6.2.8	EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is	
	used	532
A.5.6.2.8.1	Test Purpose and Environment	
A.5.6.2.8.2	Test Requirements	
A.5.6.3	L1-RSRP measurement for beam reporting	
A.5.6.3.1	SSB based L1-RSRP measurement when DRX is not used	
A.5.6.3.1.1	Test Purpose and Environment	
A.5.6.3.1.2	Test parameters	
A.5.6.3.1.3	Test Requirements	
A.5.6.3.2	SSB based L1-RSRP measurement when DRX is used	
A.5.6.3.3	CSI-RS based L1-RSRP measurement when DRX is not used	
A.5.6.3.3.1	Test Purpose and Environment	
A.5.6.3.3.2	Test parameters	
A.5.6.3.3.3	Test Requirements	

A.5.6.3.4	CSI-RS based L1-RSRP measurement when DRX is used	
	easurement Performance requirements	
A.5.7.1	SS-RSRP	
A.5.7.1.1	EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell	
A.5.7.1.1.1	Test Purpose and Environment	
A.5.7.1.1.2	Test parameters	
A.5.7.1.1.3	Test Requirements	
A.5.7.2	SS-RSRQ	547
A.5.7.2.1	EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell	517
A.5.7.2.1.1	Test Purpose and Environment	
A.5.7.2.1.1 A.5.7.2.1.2	Test Parameters	
A.5.7.2.1.3	Test Requirements	
A.5.7.2.2	EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell	
A.5.7.2.2.1	Test Purpose and Environment	
A.5.7.2.2.2	Test Parameters	
A.5.7.2.2.3	Test Requirements	
A.5.7.3	SS-SINR	552
A.5.7.3.1	EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell	552
A.5.7.3.1.1	Test Purpose and Environment	
A.5.7.3.1.2	Test Parameters	
A.5.7.3.1.3	Test Requirements	
A.5.7.3.2	EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell	
A.5.7.3.2.1	Test Purpose and Environment	
A.5.7.3.2.2	Test Parameters	
A.5.7.3.2.3	Test Requirements	
A.5.7.4	L1-RSRP measurement for beam reporting	
	id	
A.6.6.2.5 A.6.6.2.5.1	SA event triggered reporting tests for FR1 with SSB time index detection when DRX is not used	
A.6.6.4	Test Purpose and Environment	
A.7.3.1	Handover	
A.7.3.1 A.7.3.1.1	Inter-frequency handover from FR1 to FR2; unknown target cell	
A.7.3.1.1	Test Purpose and Environment	
A.7.3.1.1.2	Test Parameters	
A.7.3.1.1.3	Test Requirements	
A.7.3.1.2	Intra-frequency handover from FR2 to FR2; unknown target cell	
A.7.3.1.2.1	Test Purpose and Environment	
A.7.3.1.2.2	Test Parameters	764
A.7.3.1.2.3	Test Requirements	
A.7.3.1.3	Inter-frequency handover from FR2 to FR2; unknown target cell	766
A.7.3.1.3.1	Test Purpose and Environment	
A.7.3.1.3.2	Test Parameters	
	est Requirements	
A.7.3.2.1.3	Intra-frequency RRC Re-establishment in FR2 without serving cell timing	
A.7.3.2.1.3.1	Test Purpose and Environment	
A.7.3.2.1.3.2	Test Requirements	
A.7.5.1.9	UE Radio Link Monitoring Scheduling Restrictions on FR2	
A.7.5.1.9.1 A.7.5.1.9.2	Test Purpose and Environment Test Requirements	
A.7.5.6.1.3	NR FR2 DL active BWP switch with non-DRX in SA	
A.7.5.6.1.3.1	Test Purpose and Environment	
A.7.5.6.1.3.1 A.7.5.6.1.3.2	Test Purpose and Environment  Test Requirements	
A.7.6.3	L1-RSRP measurement for beam reporting.	
A.7.6.3.1	SSB based L1-RSRP measurement when DRX is not used	
A.7.6.3.2	SSB based L1-RSRP measurement when DRX is used	
A.7.6.3.3	CSI-RS based L1-RSRP measurement when DRX is not used	
A.7.6.3.4	CSI-RS based L1-RSRP measurement when DRX is used	
A.8.2.1	Inter-RAT NR Cell re-selection	
A.8.2.1.1	E-UTRA Cell reselection to higher priority NR target Cell in FR1	
A.8.2.1.1.1	Test Purpose and Environment	
A.8.2.1.1.2	Test Requirements	924

A.8.3.	.1	Handover	
A.8.3.	1.1	E-UTRAN - NR handover in FR1	
A.8.3.	1.1.1	Test Purpose and Environment	925
A.8.3.	1.1.2	Test Requirements	928
A.8.4.	2	E-UTRA – NR Inter-RAT Measurements	933
A.8.4.	2.1	NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when	
		DRX is not used	933
A.8.4.	2.1.1	Test Purpose and Environment	933
A.8.4.	2.1.2	Test Requirements	937
A.8.4.	2.2	NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when	
		DRX is used	
A.8.4.	2.2.1	Test Purpose and Environment	938
A.8.4.	2.2.2	Test Requirements	941
A.8.4.	2.3	NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX	
		is not used	
A.8.4.		Test Purpose and Environment	
A.8.4.		Test Requirements	
A.8.4.	2.4	NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX	
		is used	
A.8.4.		Test Purpose and Environment	
A.8.4.		Test Requirements	949
A.8.4.	2.5	NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when	0.50
	251	DRX is not used	
A.8.4.		Test Purpose and Environment	
A.8.4.		Test Requirements	952
A.8.4.	2.6	NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when	0.50
	0 ( 1	DRX is used	
A.8.4.		Test Purpose and Environment	
A.8.4. A.8.4.		Test Requirements	
A.o.4.	.2.1	NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used	
A.8.4.	271	Test Purpose and Environment	
A.8.4.		Test Requirements	
A.8.4. A.8.4.		NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX	
л.о.т.	.2.0	is used	
A.8.4.	281	Test Purpose and Environment	
A.8.4.		Test Requirements	
A.8.5.		SFTD accuracy	
A.8.5.		Test Purpose	
A.8.5.		Test Environment	
A.8.5.		Test Requirements	
A.8.5.		E-UTRAN – NR inter-RAT measurements with FR2 target cell	
	2.1.2.1	Test Purpose and Environment	
	2.1.2.2	Test Parameters	
A.8.5.	2.1.2.3	Test Requirements	
A.8.5.	2.2	SS-RSRQ	
A.8.5.	2.2.2	E-UTRAN – NR inter-RAT measurements with FR2 target cell	
A.8.5.	2.2.2.1	Test Purpose and Environment	976
A.8.5.	2.2.2.2	Test Parameters	976
A.8.5.	2.2.2.3	Test Requirements	978
A.8.5.	2.3	SS-SINR	
A.8.5.	2.3.2	E-UTRAN – NR inter-RAT measurements with FR2 target cell	
A.8.5.	2.3.2.1	Test Purpose and Environment	
	2.3.2.2	Test Parameters	
A.8.5.	2.3.2.3	Test Requirements	984
Anne	ex B (no	ormative): Conditions for RRM requirements applicability for operating bands .	985
B.2	Condi	tions for UE measurements procedures and performance requirements in	
- =		CONNECTED state	987
B.2.1		roduction	
B 2 1		Conoral	087

B.2.1.2	Derivation of Minimum SSB_RP values for FR1	987
B.2.1.3	Derivation of Minimum SSB_RP values for FR2	987
B.2.1.3.1	Minimum SSB_RP values for Rx Beam Peak angle of arrival	987
B.2.2	Conditions for NR intra-frequency measurements	989
B.2.3	Conditions for NR inter-frequency measurements	990
B.2.4.1	Conditions for SSB based L1-RSRP reporting	991
B.2.4.2	Conditions for CSI-RS based L1-RSRP reporting	992
B.2.5	Conditions for RRC connection release with redirection to NR	993
B.2.6	Conditions for UE transmit timing	994
B.2.6.1	Conditions for SSB based UE transmit timing	994
B.2.6.2	Conditions for CSI-RS based UE transmit timing	995
B.3 RI	RM Requirements Exceptions	997
B.3.1	Introduction	997
B.3.2	Receiver sensitivity relaxation for CA	997
B.3.2.1	Receiver sensitivity relaxation for UE supporting CA in FR1	997
B.3.2.2	Receiver sensitivity relaxation for UE configured with CA in FR1	997
B.3.2.2.1	Inter-band carrier aggregation	997
B.3.2.2.2	Reference sensitivity exceptions due to UL harmonic interference for CA	997
B.3.2.2.3	Reference sensitivity exceptions due to intermodulation interference due to 2UL CA	997
B.3.2.3	Receiver sensitivity relaxation for UE supporting CA in FR2	998
B.3.2.4	Receiver sensitivity relaxation for UE configured with CA in FR2	998
B.3.2.4.1	Intra-band contiguous carrier aggregation	998
B.3.2.4.2	Intra-band non-contiguous carrier aggregation	998
B.3.3	Receiver sensitivity relaxation for DC	998
B.3.4	Receiver sensitivity relaxation for SUL	998
B.3.4.1	Receiver sensitivity relaxation for UE supporting SUL in FR1	998
B.3.4.2	Receiver sensitivity relaxation for UE configured with SUL in FR1	998
B.3.4.2.1	Reference sensitivity exceptions due to UL harmonic interference for SUL	
Annex C	C (informative): Change history	999
History		1000

### **Foreword**

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

#### where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

## 1 Scope

The present document specifies requirements for support of Radio Resource Management for the FDD and TDD modes of New Radio(NR). These requirements include requirements on measurements in NR and the UE as well as requirements on node dynamical behaviour and interaction, in terms of delay and response characteristics.

## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]	3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode".
[2]	3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
[3]	3GPP TS 38.213: "NR; Physical layer procedures for control".
[4]	3GPP TS 38.215: "NR; Physical layer measurements".
[5]	3GPP TS 38.533: "NR; User Equipment (UE) conformance specification; Radio Resource Management (RRM)".
[6]	3GPP TS 38.211: "NR; Physical channels and modulation".
[7]	3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".
[8]	3GPP TS 38. 212 "NR; Multiplexing and channel coding".
[9]	3GPP TS 38.202: "NR; Physical layer services provided by the physical layer".
[10]	3GPP TS 38.300: "NR; Overall description; Stage-2".
[11]	3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
[12]	3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".
[13]	3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".
[14]	3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".
[15]	3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".
[16]	3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".
[17]	3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multiconnectivity", Stage 2.
[18]	3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
[19]	3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[20]	3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".
[21]	3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".
[22]	3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".
[23]	3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".
[24]	3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA); Overall description".
[25]	3GPP TS 36.101: "Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".
[26]	3GPP TS 38.214: "NR; Physical layer procedures for data".
[27]	3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".
[28]	3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".

## 3 Definitions, symbols and abbreviations

#### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [11] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [11].

Active DL BWP: Active DL bandwidth part as defined in TS 38.213 [3].

**Blackbox Approach:** Testing methodology, in which the UE internal implementation of certain specific UE functionality involved in the test, is unknown.

**DL BWP**: DL bandwidth part as defined in TS 38.213 [3].

EN-DC: E-UTRA-NR Dual Connectivity as defined in clause 4.1.2 of TS 37.340 [17].

en-gNB: As defined in TS 37.340 [17].

FR1: Frequency range 1 as defined in clause 5.1 of TS 38.104 [13].

FR2: Frequency range 2 as defined in clause 5.1 of TS 38.104 [13].

**gNB**: as defined in TS 38.300 [10].

Master Cell Group: As defined in TS 38.331 [2].

**Multi-Radio Dual Connectivity:** Dual Connectivity between E-UTRA and NR nodes, or between two NR nodes, as defined in TS 37.340 [17].

ng-eNB: As defined in TS 38.300 [10].

NE-DC: NR-E-UTRA Dual Connectivity as defined in clause 4.1.3.2 of TS 37.340 [17].

NGEN-DC: NG-RAN E-UTRA-NR Dual Connectivity as defined in clause 4.1.3.1 of TS 37.340 [17].

NR-DC: NR-NR Dual Connectivity as defined in clause 4.1.3.3 of TS 37.340 [17].

Primary Cell: As defined in TS 38.331 [2].

**RLM-RS resource:** A resource out of the set of resources configured for RLM by higher layer parameter RLM-RS-List [2] as defined in TS 38.213 [3].

SA operation mode: Operation mode when the UE is configured with at least PCell and not any MR-DC.

**Secondary Cell**: As defined in TS 38.331 [2].

**Secondary Cell Group:** As defined in TS 38.331 [2].

Serving Cell: As defined in TS 38.331 [2].

**SMTC**: An SSB-based measurement timing configuration configured by *SSB-MeasurementTimingConfiguration* as specified in TS 38.331 [2].

**SSB:** SS/PBCH block as defined in clause 7.8.3 of TS 38.211 [6].

Timing Advance Group: As defined in TS 38.331 [2].

#### 3.2 Symbols

For the purposes of the present document, the following symbols apply:

[...] Values included in square bracket must be considered for further studies, because it means that a

decision about that value was not taken.

T<sub>c</sub> Basic time unit, defined in clause 4.1 of TS 38.211 [6].
T<sub>s</sub> Reference time unit, defined in clause 4.1 of TS 38.211 [6].

·

#### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [11] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [11].

BFD Beam Failure Detection

BWP Bandwidth Part
CA Carrier Aggregation
CBD Candidate Beam Detection

CC Component Carrier CP Cyclic Prefix

CSI Channel-State Information
CSI-RS CSI Reference Signal
DC Dual Connectivity

DL Downlink

DMRS Demodulation Reference Signal DRX Discontinuous Reception

E-CID Enhanced Cell ID
E-UTRA Evolved UTRA
E-UTRAN Evolved UTRAN

EN-DC E-UTRA-NR Dual Connectivity FDD Frequency Division Duplex

FR Frequency Range

HARO Hybrid Automatic Repeat Request

HO Handover

MAC Medium Access Control MCG Master Cell Group MGL Measurement Gap Length

MGRP Measurement Gap Repetition Period

MIB Master Information Block
MR-DC Multi-Radio Dual Connectivity
NE-DC NR-E-UTRA Dual Connectivity

NGEN-DC NG-RAN E-UTRA-NR Dual Connectivity

NR New Radio

NR-DC NR-NR Dual Connectivity

OFDM Orthogonal Frequency Division Multiplexing
OFDMA Orthogonal Frequency Division Multiple Access

OTDOA Observed Time Difference Of Arrival

PBCH Physical Broadcast Channel

PCell Primary Cell

PLMN Public Land Mobile Network

PRACH Physical RACH PSCell Primary SCell

PSS Primary Synchronization Signal
PUCCH Physical Uplink Control Channel
PUSCH Physical Uplink Shared Channel

**RACH** Random Access Channel Radio Access Technology **RAT** Radio Link Monitoring **RLM** Reference Signal for RLM **RLM-RS RRC** Radio Resource Control **RRM** Radio Resource Management Received Signal Strength Indicator **RSSI RSTD** Reference Signal Time Difference SA Standalone operation mode

Secondary Cell **SCell** Secondary Cell Group SCG **Subcarrier Spacing** SCS SSB subcarrier spacing  $SCS_{SSB}$ **SDL** Supplementary Downlink **SFN** System Frame Number SI **System Information** System Information Block SIB

SMTC SSB-based Measurement Timing configuration

SRS Sounding Reference Signal

SS-RSRP Synchronization Signal based Reference Signal Received Power SS-RSRQ Synchronization Signal based Reference Signal Received Quality SS-SINR Synchronization Signal based Signal to Noise and Interference Ratio

SSB Synchronization Signal Block

SSB RP Received (linear) average power of the resource elements that carry NR SSB signals and channels,

measured at the UE antenna connector.

SSS Secondary Synchronization Signal

SUL Supplementary Uplink
TA Timing Advance
TAG Timing Advance Group
TDD Time Division Duplex
TTI Transmission Time Interval

UE User Equipment

UL Uplink

#### 3.4 Test tolerances

The requirements given in the present document make no allowance for measurement uncertainty. The test specification 38.5xx[x] defines the test tolerances.

Editor's note: intended to capture test tolerances. OTA test tolerance or margin will be captured in this section if needed.

## 3.5 Frequency bands grouping

#### 3.5.1 Introduction

The intention with the frequency band grouping below is to increase the readability of the specification.

The frequency bands grouping is derived based on UE REFSENS requirements specified in [18, 19, 20] and assuming 0.5 dB step between the neighbour groups. The groups are defined in the order of increasing REFSENS, i.e., the group A has the smallest REFSENS among the groups. For the same SCS and a given bandwidth, the bands within the same group have the same Io conditions in a corresponding requirement in this specification, provided the bands support this SCS. For different SCSs supported by a frequency band and the same bandwidth, different Io conditions may apply for the frequency band in the requirements, while the band group is the same, based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported SCSs for this bandwidth. For the same SCS but different supported bandwidths, the group for a band is determined based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported bandwidths.

#### 3.5.2 NR operating bands in FR1

NR frequency bands grouping for FR1 is specified in Table 3.5.2-1.

Table 3.5.2-1: NR frequency band groups for FR1

Group	NR FDD		NR TDD		NR SDL	
	Band group notation	Operating bands	Band group notation	Operating bands	Band group notation	Operating bands
Α	NR_FDD_FR1_A	n1, n70, n74 <sup>4</sup>	NR_TDD_FR1_A	n34, n38, n39, n40, n50, n51	NR_SDL_FR1_A	n75, n76
В	NR_FDD_FR1_B	n66, n74 <sup>3</sup>	NR_TDD_FR1_B	-	NR_SDL_FR1_B	-
С	NR_FDD_FR1_C	-	NR_TDD_FR1_C	n77 <sup>1</sup> , n78, n79	NR_SDL_FR1_C	-
D	NR_FDD_FR1_D	n28	NR_TDD_FR1_D	n77 <sup>2</sup>	NR_SDL_FR1_D	-
Е	NR_FDD_FR1_E	n2, n5, n7	NR_TDD_FR1_E	n41	NR_SDL_FR1_E	-
F	NR_FDD_FR1_F	-	NR_TDD_FR1_F	-	NR_SDL_FR1_F	-
G	NR_FDD_FR1_G	n3, n8, n12, n20, n71	NR_TDD_FR1_G	-	NR_SDL_FR1_G	-
Н	NR_FDD_FR1_H	n25	NR_TDD_FR1_H	-	NR_SDL_FR1_H	-

- NOTE 1: Except 3.8 GHz to 4.2 GHz.
- NOTE 2: Only 3.8 GHz to 4.2 GHz.
- NOTE 3: Except 1475.9 MHz to 1510.9 MHz.
- NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.
- NOTE 5: These bands are used only in NR carrier aggregation with other NR bands according to NR CA band combinations specified in TS 38.101-1 [18] and TS 38.101-3 [20].

## 3.5.3 NR operating bands in FR2

NR frequency bands grouping for FR2 is specified in Table 3.5.3-1.

Group Band group notation Operating bands NR\_TDD\_FR2\_A n257<sup>1</sup>, n258<sup>1</sup>, n261<sup>1</sup> В n2574, n2584, n2614 NR\_TDD\_FR2\_B NR\_TDD\_FR2\_C С D NR\_TDD\_FR2\_D Ε NR\_TDD\_FR2 NR\_TDD\_FR2\_F F n2604 n257<sup>2</sup>, n258<sup>2</sup>, n260<sup>1</sup>, n261<sup>2</sup> G NR\_TDD\_FR2\_G NR\_TDD\_FR2\_H Н NR\_TDD\_FR2 NR\_TDD\_FR2\_J .1 NR TDD\_FR2\_K K NR TDD FR2 L Μ NR TDD FR2 M Ν NR\_TDD\_FR2\_N 0 NR\_TDD\_FR2\_O NR\_TDD\_FR2\_P Р Q NR\_TDD\_FR2\_Q NR\_TDD\_FR2\_R R NR\_TDD\_FR2\_S S NR\_TDD\_FR2 n2573, n2583, n2613 U NR\_TDD\_FR2\_U NR\_TDD\_FR2\_V V NR\_TDD\_FR2\_W W NR\_TDD\_FR2 X NR\_TDD\_FR2\_Y n260<sup>3</sup> NOTE 1: UE power class 1. NOTE 2: UE power class 2. NOTE 3: UE power class 3. NOTE 4: UE power class 4.

Table 3.5.3-1: NR frequency band groups for FR2

## 3.6 Applicability of requirements in this specification version

In this specification,

- 'cell', 'PCell', 'PSCell' and 'SCell' refer to NR cell, NR PCell, NR PSCell, and NR SCell,
- E-UTRA cells are referred to as 'E-UTRA cell', 'E-UTRA PCell', 'E-UTRA PSCell', and 'E-UTRA SCell',
- E-UTRA-NR dual connectivity where E-UTRA is the master is referred to as 'E-UTRA-NR dual connectivity' or 'EN-DC'.
- NR-NR dual connectivity which involves two gNB acting as Master gNB and Secondary gNB is referred to as "NR-NR dual connectivity" or "NR-DC". NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.
- 'active serving cell' refers to PCell, PSCell and activated SCells

For UE configured with supplementary UL, the requirements in clause 7.1 and 7.3 shall also apply to uplink transmissions on supplementary UL.

#### 3.6.1 RRC connected state requirements in DRX

For the requirements in RRC connected state specified in this version of the specification, the UE shall assume that no DRX is used provided the following conditions are met:

- DRX parameters are not configured or
- DRX parameters are configured and
  - drx-InactivityTimer is running or

- drx-RetransmissionTimerDL is running or
- drx-RetransmissionTimerUL is running or
- ra-ContentionResolutionTimer is running or
- a Scheduling Request sent on PUCCH is pending or
  - a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the preamble not selected by the MAC entity

Otherwise the UE shall assume that DRX is used.

#### 3.6.2 Number of serving carriers

#### 3.6.2.1 Number of serving carriers for SA

Requirements for standalone NR with NR PCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 8 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PCell and up to 1 UL (or 2 UL if SUL is configured) in SCell.
- SUL may be configured together with one of the UL

#### 3.6.2.2 Number of serving carriers for EN-DC

Requirements for EN-DC operation of E-UTRA and NR with E-UTRA PCell and NR PSCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 7 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PSCell and up to 1 UL (or 2 UL if SUL is configured) in SCell in different FR with PSCell.
- SUL may be configured together with one of the UL

The applicable number of E-UTRA CC for EN-DC in the MCG for both UL and DL is specified in TS 36.133 [15].

#### 3.6.2.3 Number of serving carriers for NE-DC

Requirements for NE-DC operation of NR and E-UTRA with NR PCell and E-UTRA PSCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 7 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PCell and up to 1 UL (or 2 UL if SUL is configured) in SCell.
- SUL may be configured together with one of the UL

The applicable number of E-UTRA CC for NE-DC in the SCG for both UL and DL is specified in TS 36.133 [15].

#### 3.6.2.4 Number of serving carriers for NR-DC

Requirements for NR-DC are applicable for the UE configured with the following number of serving NR CCs:

- up to 2 NR DL CCs in total in FR1, up to 8 NR DL CCs in total in FR2, with 1 UL (or 2 UL if SUL is configured) in PCell, 1 UL (or 2 UL if SUL is configured) in PSCell, and up to 1 UL (or 2 UL if SUL is configured) in each SCell.
- SUL may be configured together with one of the UL.

#### 3.6.3 Applicability for intra-band FR2

For the requirements in RRC connected state specified in this version of the specification, UE shall assume that the transmitted signals from the serving cells should have the same downlink spatial domain transmission filter on one OFDM symbol in the same band in FR2. Otherwise, the UE is not supposed to satisfy any requirements for SCell.

#### 3.6.4 Applicability for FR2 UE power classes

For the requirements of each FR2 power class specified in this version of the specification, certain UE types with specific device architectures are assumed. The UE types can be found in TS 38.101-2 [19].

#### 3.6.5 Applicability for SDL bands

The measurements accuracy requirements for SDL bands in this version of specification in clause 10.1 shall apply for NR intra-frequency measurements on SCC (SS-RSRP, SS-RSRQ, SS-SINR, and L1-RSRP) and inter-frequency measurements (SS-RSRP, SS-RSRQ, and SS-SINR).

#### 3.6.6 Applicability of requirements for NGEN-DC operation

All the requirements in this specification applicable for EN-DC are also applicable for NGEN-DC.

## 4 SA: RRC\_IDLE state mobility

Editor's note: intended to capture the RRM requirements for RRC\_IDLE state in stand-alone operation.

#### 4.1 Cell Selection

After a UE has switched on and a PLMN has been selected, the Cell selection process takes place, as described in TS 38.304. This process allows the UE to select a suitable cell where to camp on in order to access available services. In this process, the UE can use stored information (*Stored information cell selection*) or not (*Initial cell selection*).

#### 4.2 Cell Re-selection

#### 4.2.1 Introduction

The cell reselection procedure allows the UE to select a more suitable cell and camp on it.

When the UE is in either *Camped Normally* state or *Camped on Any Cell* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. For intra-frequency and inter-frequency cells the serving cell may not provide explicit neighbour list but carrier frequency information and bandwidth information only. UE measurement activity is also controlled by measurement rules defined in TS 38.304, allowing the UE to limit its measurement activity.

In the requirements of clause 4.2, the exceptions for side conditions apply as follows:

- for the UE capable of CA, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1, B.3.2.3, or B.3.2.5 for UE supporting CA in FR1, CA in FR2 and CA between FR1 and FR2, respectively;
- for the UE capable of SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1.

#### 4.2.2 Requirements

#### 4.2.2.1 UE measurement capability

For idle mode cell re-selection purposes, the UE shall be capable of monitoring at least:

- Intra-frequency carrier, and
- Depending on UE capability, 7 NR inter-frequency carriers, and
- Depending on UE capability, 7 FDD E-UTRA inter-RAT carriers, and
- Depending on UE capability, 7 TDD E-UTRA inter-RAT carriers.

In addition to the requirements defined above, a UE supporting E-UTRA measurements in RRC\_IDLE state shall be capable of monitoring a total of at least 14 carrier frequency layers, which includes serving layer, comprising of any above defined combination of E-UTRA FDD, E-UTRA TDD and NR layers.

#### 4.2.2.2 Measurement and evaluation of serving cell

The UE shall measure the SS-RSRP and SS-RSRQ level of the serving cell and evaluate the cell selection criterion S defined in TS 38.304 [1] for the serving cell at least once every M1\*N1 DRX cycle; where:

M1=2 if SMTC periodicity ( $T_{SMTC}$ ) > 20 ms and DRX cycle  $\leq 0.64$  second,

otherwise M1=1.

The UE shall filter the SS-RSRP and SS-RSRQ measurements of the serving cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2.

If the UE has evaluated according to Table 4.2.2.2-1 in  $N_{\text{serv}}$  consecutive DRX cycles that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information for 10 s, the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1].

Table 4.2.2.2-1: N<sub>serv</sub>

DRX cycle length [s]	Scaling Factor (N1)		N <sub>serv</sub> [number of DRX cycles]
	FR1	FR2Note1	
0.32		8	M1*N1*4
0.64	4	5	M1*N1*4
1.28	'	4	N1*2
2.56		3	N1*2

Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.

#### 4.2.2.3 Measurements of intra-frequency NR cells

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 within  $T_{\text{detect},NR\_Intra}$  when that Treselection= 0. An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every  $T_{measure,NR\_Intra}$  (see table 4.2.2.3-1) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{measure,NR\ Intra}/2$ .

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within  $T_{\text{evaluate,NR Intra}}$  when  $T_{\text{reselection}} = 0$  as specified in table 4.2.2.3-1 provided that:

when rangeToBestCell is not configured:

the cell is at least [3]dB better ranked in FR1 or [4.5]dB better ranked in FR2.

when rangeToBestCell is configured:

- the cell which has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
  - [if there are multiple such cells the UE shall perform cell reselection to the highest ranked cell among them.]

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells

If  $T_{reselection}$  timer has a non zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [1], the UE shall evaluate this intra-frequency cell for the  $T_{reselection}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

Table 4.2.2.3-1: T<sub>detect,NR\_Intra</sub>, T<sub>measure,NR\_Intra</sub> and T<sub>evaluate,NR\_Intra</sub>

DRX cycle   Scaling Factor		actor (N1)	T <sub>detect,NR_Intra</sub> [S]	T <sub>measure,NR_Intra</sub> [S]	Tevaluate,NR_Intra	
length [s]	FR1	FR2 <sup>Note1</sup>	(number of DRX cycles)	(number of DRX cycles)	[s] (number of DRX cycles)	
0.32		8	11.52 x N1 x M2 (36 x	1.28 x N1 x M2 (4 x N1	5.12 x N1 x M2 (16 x	
			N1 x M2)	x M2)	N1 x M2)	
0.64	1	5	17.92 x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)	
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)	
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)	

Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.

Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.

#### 4.2.2.4 Measurements of inter-frequency NR cells

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If  $Srxlev > S_{nonIntraSearchP}$  and  $Squal > S_{nonIntraSearchQ}$  then the UE shall search for inter-frequency layers of higher priority at least every  $T_{higher\_priority\_search}$  where  $T_{higher\_priority\_search}$  is described in clause 4.2.2.7.

If  $Srxlev \leq S_{nonIntraSearchP}$  or  $Squal \leq S_{nonIntraSearchQ}$  then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this subclause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 within  $K_{carrier} * T_{detect,NR\_Inter}$  if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when  $T_{reselection} = 0$  provided that the reselection criteria is met by a margin of at least [5] dB in FR1 or [6.5]dB in FR2 for reselections based on ranking or [6]dB in FR1 or [7.5]dB in FR2 for SS-RSRP reselections based on absolute priorities or [4]dB in FR1 and [4]dB in FR2 for SS-RSRQ reselections based on absolute priorities. The parameter  $K_{carrier}$  is the number of NR inter-frequency carriers indicated by the serving cell. An inter-

frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,NR\_Inter. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every  $K_{carrier} * T_{measure,NR\_Inter}$  (see table 4.2.2.4-1) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority interfrequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{measure,NR\_Inter}/2$ .

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 within  $K_{carrier} * T_{evaluate,NR\_Inter}$  when  $T_{reselection} = 0$  as specified in table 4.2.2.4-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

when rangeToBestCell is not configured:

- the cell is at least [5]dB better ranked in FR1 or [6.5]dB better ranked in FR2 or.

when rangeToBestCell is configured:

- the cell which has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
  - [if there are multiple such cells the UE shall perform cell reselection to the highest ranked cell among them] or
- [6]dB in FR1 or [7.5]dB in FR2 for SS-RSRP reselections based on absolute priorities or
- [4]dB in FR1 or [4] in FR2 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If  $T_{reselection}$  timer has a non zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the  $T_{reselection}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 under the following conditions:

- T<sub>SMTC\_intra</sub> = T<sub>SMTC\_inter</sub> = 160 ms; where T<sub>SMTC\_intra</sub> and T<sub>SMTC\_inter</sub> are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion [1].

DRX cycle	Scaling Factor (N1)		T <sub>detect,NR_Inter</sub> [S]	Tmeasure,NR_Inter [S]	T <sub>evaluate,NR_Inter</sub> [s] (number of DRX	
length [s]	FR1	FR2 <sup>Note1</sup>	- (number of DRX cycles)	(number of DRX cycles)	cycles)	
0.32		8	11.52 x N1 x 1.5 (36 x	1.28 x N1 x 1.5 (4 x N1	5.12 x N1 x 1.5 (16 x	
			N1 x 1.5)	x 1.5)	N1 x 1.5)	
0.64	1	5	17.92x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)	
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)	
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)	
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle						
length.						

Table 4.2.2.4-1: T<sub>detect,NR\_Inter</sub>, T<sub>measure,NR\_Inter</sub> and T<sub>evaluate,NR\_Inter</sub>

#### 4.2.2.5 Measurements of inter-RAT E-UTRAN cells

If  $Srxlev > S_{nonIntraSearchP}$  and  $Squal > S_{nonIntraSearchQ}$  then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every  $T_{higher\_priority\_search}$  where  $T_{higher\_priority\_search}$  is described in clause 4.2.2

If  $Srxlev \leq S_{nonIntraSearchQ}$  or  $Squal \leq S_{nonIntraSearchQ}$  then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this section apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this section. The parameter  $N_{EUTRA\_carrier}$  is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{measure,EUTRAN}/2$ .

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band, and
- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.
- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 within ( $N_{EUTRA\_carrier}$ ) \*  $T_{detect,EUTRAN}$  when  $Srxlev \leq S_{nonIntraSearchP}$  or  $Squal \leq S_{nonIntraSearchP}$  when  $T_{reselection} = 0$  provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every ( $N_{EUTRA\_carrier}$ ) \*  $T_{measure,EUTRAN}$  when  $Srxlev \leq S_{nonIntraSearchP}$  or  $Squal \leq S_{nonIntraSearchQ}$ .

When higher priority cells are found by the higher priority search, they shall be measured at least every  $T_{\text{measure,EUTRAN}}$ . If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS

38.304 [1] within (N<sub>EUTRA\_carrier</sub>) \* T<sub>evaluate,EUTRAN</sub> when T<sub>reselection</sub> = 0 as speficied in table 4.2.2.5-1 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If  $T_{reselection}$  timer has a non zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [1], the UE shall evaluate this E-UTRA cell for the  $T_{reselection}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

DRX Tdetect, EUTRAN [S] Tmeasure, EUTRAN [S] Tevaluate, EUTRAN [s] (number of DRX (number of DRX cycle (number of length DRX cycles) cycles) cycles) [s] 11.52 (36) 1.28 (4) 5.12 (16) 0.32 0.64 17.92 (28) 1.28 (2) 5.12 (8) 1.28 32(25) 1.28 (1) 6.4 (5) 58.88 (23) 2.56 (1) 7.68 (3) 2.56

Table 4.2.2.5-1: T<sub>detect,EUTRAN</sub>, T<sub>measure,EUTRAN</sub>, and T<sub>evaluate,EUTRAN</sub>

#### 4.2.2.6 Maximum interruption in paging reception

UE shall perform the cell re-selection with minimum interruption in monitoring downlink channels for paging reception.

At intra-frequency and inter-frequency cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels of the target intra-frequency and inter-frequency cell for paging reception. The interruption time shall not exceed  $T_{SI-NR} + 2*T_{target\_cell\_SMTC\_period}$  ms.

At inter-RAT cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels for paging reception of the target inter-RAT cell. For NR to E-UTRAN cell re-selection the interruption time must not exceed  $T_{SI\text{-}EUTRA} + 55$  ms.

T<sub>SI-NR</sub> is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for an NR cell.

 $T_{SI\text{-}EUTRA}$  is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [16] for an E-UTRAN cell.

These requirements assume sufficient radio conditions, so that decoding of system information can be made without errors and does not take into account cell re-selection failure.

#### 4.2.2.7 General requirements

The UE shall search every layer of higher priority at least every  $T_{higher\_priority\_search} = ([60] * N_{layers})$  seconds, where  $N_{layers}$  is the total number of higher priority NR and E-UTRA carrier frequencies broadcasted in system information.

## 5 SA: RRC\_INACTIVE state mobility

#### 5.1 Cell Re-selection

#### 5.1.1 Introduction

The cell reselection procedure allows the UE to select a more suitable cell and camp on it.

When the UE is in *Camped Normally* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. For intra-frequency and inter-frequency cells the serving cell may not provide explicit neighbour list but carrier frequency information and bandwidth information only. UE measurement activity is also controlled by measurement rules defined in TS38.304, allowing the UE to limit its measurement activity.

#### 5.1.2 Requirements

#### 5.1.2.1 UE measurement capability

The requirements in sub-clause 4.2.2.1 shall apply.

#### 5.1.2.2 Measurement and evaluation of serving cell

The requirements in sub-clause 4.2.2.2 shall apply.

#### 5.1.2.3 Measurements of intra-frequency NR cells

The requirements in sub-clause 4.2.2.3 shall apply.

#### 5.1.2.4 Measurements of inter-frequency NR cells

The requirements in sub-clause 4.2.2.4 shall apply.

#### 5.1.2.5 Measurements of inter-RAT E-UTRAN cells

The requirements in sub-clause 4.2.2.5 shall apply.

#### 5.1.2.6 Maximum interruption in paging reception

The requirements in sub-clause 4.2.2.6 shall apply.

#### 5.1.2.7 General requirements

The requirements in sub-clause 4.2.2.7 shall apply.

## 5.2 RRC\_INACTIVE Mobility Control

Editor's note: intended to capture requirements which applies for the transition between INACTIVE and IDLE state. This section might be removed if unnecessary.

## 6 RRC\_CONNECTED state mobility

#### 6.1 Handover

#### 6.1.1 NR Handover

#### 6.1.1.1 Introduction

The purpose of NR handover is to change the NR PCell to another NR cell. The requirements in this clause are applicable to SA NR, NE-DC and NR-DC.

#### 6.1.1.2 NR FR1 - NR FR1 Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell.

#### 6.1.1.2.1 Handover delay

Procedure delays for all procedures that can command a handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{handover}$  seconds from the end of the last TTI containing the RRC command.

#### Where:

D<sub>handover</sub> equals the maximum RRC procedure delay to be defined in clause12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.2.2.

#### 6.1.1.2.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

$$T_{interrupt} = T_{search} + T_{IU} + 20 + T_{\Delta} ms$$

#### Where:

 $T_{search}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{search} = 0$  ms. If the target cell is an unknown intrafrequency cell and the target cell Es/Iot $\geq$ [-2] dB, then  $T_{search} = T_{rs} + 2$  ms. If the target cell is an unknown interfrequency cell and the target cell Es/Iot $\geq$ [-2] dB, then  $T_{search} = [3*T_{rs} + 2]$  ms. Regardless of whether DRX is in use by the UE,  $T_{search}$  shall still be based on non-DRX target cell search times.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{rs}$ .

 $T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

 $T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with  $T_{rs}=[5]ms$  assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

NOTE 1: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2.5 for intra-frequency handover and Clause 9.3.1 for inter-frequency handover.

#### 6.1.1.3 NR FR2- NR FR1 Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR2 cell to NR FR1 cell.

#### 6.1.1.3.1 Handover delay

Procedure delays for all procedures that can command a handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within D<sub>handover</sub> seconds from the end of the last TTI containing the RRC command.

#### Where:

D<sub>handover</sub> equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.3.2.

#### 6.1.1.3.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than  $T_{interrupt}$ 

$$T_{interrupt} = T_{search} + T_{IU} + 40 + T_{\Delta} \ ms$$

#### Where:

 $T_{search}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{search} = 0$  ms. If the target cell is an unknown interfrequency cell and the target cell Es/Iot $\geq$ [-2] dB, then  $T_{search} = [3*T_{rs} + 2]$  ms. Regardless of whether DRX is in use by the UE,  $T_{search}$  shall still be based on non-DRX target cell search times.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{rs}$ .

 $T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

 $T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with  $T_{rs}=[5]$ ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command,  $T_{rs}$  follows smtc1 or smtc2 according to the physical cell ID of the target cell.

NOTE 1: The actual value of  $T_{IU}$  shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2.5 for intra-frequency handover and Clause 9.3.1 for inter-frequency handover.

#### 6.1.1.4 NR FR2- NR FR2 Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR2 cell to NR FR2 cell.

#### 6.1.1.4.1 Handover delay

Procedure delays for all procedures that can command a handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{handover}$  seconds from the end of the last TTI containing the RRC command.

Where:

 $D_{handover}$  equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.4.2.

#### 6.1.1.4.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} \ ms$$

Where:

 $T_{search}$  is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then  $T_{search} = 0$  ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot  $\geq$ [-2] dB, then  $T_{search} = [8*T_{rs} + 2]$  ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot  $\geq$ [-2] dB, then  $T_{search} = [8*3*T_{rs} + 2]$  ms. Regardless of whether DRX is in use by the UE,  $T_{search}$  shall still be based on non-DRX target cell search times.

T<sub>processing</sub> is time for UE processing. T<sub>processing</sub> can be up to 20ms.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta}$  = [1]\*  $T_{rs}$  for a known target cell and  $T_{\Delta}$  = 0 ms for an uknown target cell.

 $T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

 $T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with  $T_{rs}$ =[5]ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command,  $T_{rs}$  follows smtc1 or smtc2 according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

During the last [5] seconds before the reception of the handover command:

- the UE has sent a valid measurement report for the target cell and
- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50].

otherwise it is unknown.

NOTE 1: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

NOTE 2: Void

#### 6.1.1.5 NR FR1- NR FR2 Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR1 cell to NR FR2 cell.

#### 6.1.1.5.1 Handover delay

Procedure delays for all procedures that can command a handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{handover}$  seconds from the end of the last TTI containing the RRC command.

#### Where:

 $D_{handover}$  equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.5.2.

#### 6.1.1.5.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} \ ms$$

#### Where:

 $T_{search}$  is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then  $T_{search} = 0$  ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot  $\geq$  [-2] dB, then  $T_{search} = [8*T_{rs} + 2]$  ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot  $\geq$  [-2] dB, then  $T_{search} = [8*3*T_{rs} + 2]$  ms. Regardless of whether DRX is in use by the UE,  $T_{search}$  shall still be based on non-DRX target cell search times.

T<sub>processing</sub> is time for UE processing. T<sub>processing</sub> can be up 40ms.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = [1]^* T_{rs}$  for a known target cell and  $T_{\Delta} = 0$  ms for an unknown target cell.

 $T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

 $T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs=[5]ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the handover command,  $T_{rs}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

During the last [5] seconds before the reception of the handover command:

- the UE has sent a valid measurement report for the target cell and
- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50].

otherwise it is unknown.

NOTE 1: The actual value of  $T_{IU}$  shall depend upon the PRACH configuration used in the target cell.

NOTE 2: Void

## 6.1.2 NR Handover to other RATs

## 6.1.2.1 NR – E-UTRAN Handover

#### 6.1.2.1.1 Introduction

The purpose of inter-RAT handover from NR to E-UTRAN is to change the radio access mode of PCell from NR to E-UTRAN. The handover procedure is initiated from NR with a RRC message that implies a handover as described in TS 38.331 [2]. The requirements in this clause are applicable to SA NR, NE-DC and NR-DC.

## 6.1.2.1.2 Handover delay

When the UE receives a RRC message implying handover to E-UTRAN the UE shall be ready to start the transmission of the uplink PRACH channel in E-UTRA within  $D_{handover}$  seconds from the end of the last TTI containing the RRC command.  $D_{handover}$  is defined as

$$D_{handover} = T_{RRC\_procedure\_delay} + T_{interrupt}$$

Where:

T<sub>RRC\_procedure\_delay</sub>: it is the RRC procedure delay, which is 50ms

T<sub>interrupt</sub>: it is the time between end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission of the PRACH in E-UTRAN, excluding T<sub>RRC</sub> procedure delay. T<sub>interrupt</sub> is defined in clause 6.1.2.1.3.

## 6.1.2.1.3 Interruption time

When the inter-RAT handover to E-UTRAN is commanded, the interruption time shall be less than Tinterrupt

$$T_{interrupt} = T_{search} + T_{IU} + 20 \text{ ms}$$

Where:

 $T_{search}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{search}=0$  ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then  $T_{search}=80$  ms. Regardless of whether DRX is in use by the UE,  $T_{search}$  shall still be based on non-DRX target cell search times.

 $T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to 30 ms.

NOTE: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant E-UTRAN cell identification requirements are described in clause [9.4.1].

# 6.2 RRC Connection Mobility Control

## 6.2.1 SA: RRC Re-establishment

### 6.2.1.1 Introduction

This clause contains requirements on the UE regarding RRC connection re-establishment procedure. RRC connection re-establishment is initiated when a UE in RRC\_CONNECTED state loses RRC connection due to any of failure cases, including radio link failure, handover failure, and RRC connection reconfiguration failure. The RRC connection re-establishment procedure is specified in clause 5.3.7 of TS 38.331 [2].

The requirements in this clause are applicable for RRC connection re-establishment to NR cell.

## 6.2.1.2 Requirements

In RRC connected mode the UE shall be capable of sending RRCReestablishmentRequest message within  $T_{re-establish\_delay}$  seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ( $T_{re-establish\_delay}$ ) shall be less than:

$$T_{re-establish\_delay} = T_{UE\_re-establish\_delay} + T_{UL\_grant}$$

 $T_{UL\_grant}$ : It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit RRCReestablishmentRequest message.

The UE re-establishment delay (T<sub>UE\_re-establish\_delay</sub>) is specified in clause 6.2.1.2.1.

## 6.2.1.2.1 UE Re-establishment delay requirement

The UE re-establishment delay ( $T_{UE\_re-establish\_delay}$ ) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ( $T_{UE\_re-establish\_delay}$ ) requirement shall be less than:

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum\nolimits_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band.

 $T_{identify\_intra\_NR}$ : It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then  $T_{identify\_intra\_NR}$ =0; otherwise  $T_{identify\_intra\_NR}$  shall not exceed the values defined in table 6.2.1.2.1-1.

 $T_{identify\_inter\_NR,i}$ : It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell.  $T_{identify\_inter\_NR,i}$  shall not exceed the values defined in table 6.2.1.2.1-2.

 $T_{SMTC}$ : It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*,  $T_{smtc}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

 $T_{SMTC,i}$ : It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

 $T_{SI-NR}$  = It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

 $T_{PRACH}$  = It is the delay caused due to the random access procedure when sending random access to the target NR cell. The delay depends on the PRACH configuration defined in Table 6.3.3.2-2 [6] or Table 6.3.3.2-3 [6] for FR1 and in Table 6.3.3.2-4 [6] for FR2.

 $N_{\text{freq}}$ : It is the total number of NR frequencies to be monitored for RRC re-establishment;  $N_{\text{freq}} = 1$  if the target intrafrequency NR cell is known, else  $N_{\text{freq}} = 2$  and  $T_{\text{identify\_intra\_NR}} = 0$  if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

Table 6.2.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intrafrequency cell

Serving cell	Frequency range	Tidentify_intra_NR [ms]	
SSB Ês/lot (dB)	(FR) of target NR cell	Known NR cell	Unknown NR cell
≥ [-8]	FR1	MAX (200 ms, [5] x T <sub>SMTC</sub> )	MAX (800 ms, [10] x T <sub>SMTC</sub> )
≥ [-8]	FR2	N/A	MAX (1000 ms, [80] x T <sub>SMTC</sub> ))
< [-8]	FR1	N/A	800 <sup>Note1</sup>
< [-8]	FR2	N/A	3520 <sup>Note1</sup>
Note 1: The LIF is not required to successfully identify a cell on any NR frequency layer when T <sub>SMTC</sub> > 20 ms and			

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when T<sub>SMTC</sub> > 20 ms and serving cell SSB Ês/lot < [-8] dB.

Table 6.2.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR interfrequency cell

Serving cell SSB	Frequency range	Tidentify_inter_NR, i [ms]	
Ês/lot (dB)	(FR) of target NR cell	Known NR cell	Unknown NR cell
≥ [-8]	FR1	MAX (200 ms, [6] x T <sub>SMTC, i</sub> )	MAX (800 ms, [13] x T <sub>SMTC, i</sub> )
≥ [-8]	FR2	N/A	MAX (1000 ms, [104] x T <sub>SMTC, i</sub> ))
< [-8]	FR1	N/A	800 <sup>Note1</sup>
< [-8]	FR2	N/A	4000 <sup>Note1</sup>

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when  $T_{SMTC,i} > 20$  ms and serving cell SSB  $\hat{E}$ s/lot < [-8] dB.

## 6.2.2 Random access

## 6.2.2.1 Introduction

This clause contains requirements on the UE regarding random access procedure. The random access procedure is initiated to establish uplink time synchronization for a UE which either has not acquired or has lost its uplink synchronization, or to convey UE's request Other SI, or for beam failure recovery. The random access is specified in clause 8 of TS 38.213 [3] and the control of the RACH transmission is specified in clause 5.1 of TS 38.321 [7].

## 6.2.2.2 Requirements

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in TS 38.213 [3] and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [18] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [19] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [18] for frequency range 1 and clause 6.3.4.3 of TS38.101-2 [19] for frequency range 2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4 in TS 38.321 [7].

The requirements in this section apply for UE in SA operation mode or any MR-DC operation mode.

#### 6.2.2.2.1 Contention based random access

#### 6.2.2.2.1.1 Correct behaviour when transmitting Random Access Preamble

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB

if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [7].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

#### 6.2.2.2.1.2 Correct behaviour when receiving Random Access Response

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 6.2.2.2.1.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [7].

## 6.2.2.2.1.4 Correct behaviour when receiving a NACK on msg3

The UE shall re-transmit the msg3 upon the reception of a NACK on msg3.

## 6.2.2.2.1.5 Correct behaviour when receiving a message over Temporary C-RNTI

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

## 6.2.2.2.1.6 Correct behaviour when contention Resolution timer expires

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

## 6.2.2.2.2 Non-Contention based random access

### 6.2.2.2.2.1 Correct behaviour when transmitting Random Access Preamble

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal

probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with any of the SSBs and/or CSI-RSs is configured, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs or the selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, or from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions or the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

#### 6.2.2.2.2.2 Correct behaviour when receiving Random Access Response

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from UE, as specified in clause 5.1.4 in TS 38.321 [7].

The UE may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to UE's C-RNTI is received, as specified in clause 5.1.4 in TS 38.321 [7].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

## 6.2.2.2.2.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [7].

### 6.2.2.2.3 UE behaviour when configured with supplementary UL

In addition to the requirements defined in clause 6.2.2.2.1 and 6.2.2.2.2, a UE configured with supplementary UL carrier shall use RACH configuration for the supplementary UL carrier contained in RMSI and RRC dedicated signalling. If the cell for the random access procedure is configured with supplementary UL, the UE shall transmit or retransmit PRACH preamble on the supplementary UL carrier if the SS-RSRP measured by the UE on the DL carrier is lower than the *rsrp-ThresholdSSB-SUL* as defined in TS 38.331 [2].

## 6.2.3 SA: RRC Connection Release with Redirection

### 6.2.3.1 Introduction

This clause contains requirements on the UE regarding RRC connection release with redirection procedure. RRC connection release with redirection is initiated by the *RRCConnectionRelease* message with redirection to E-UTRAN or NR from NR specified in TS 38.331 [2]. The RRC connection release with redirection procedure is specified in clause 5.3.8 of TS 38.331 [2].

## 6.2.3.2 Requirements

### 6.2.3.2.1 RRC connection release with redirection to NR

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within  $T_{connection\_release\_redirect\_NR}$ .

The time delay ( $T_{connection\_release\_redirect\_NR}$ ) is the time between the end of the last slot containing the RRC command, "RRCRelease" (TS 38.331 [2]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ( $T_{connection\_release\_redirect\_NR}$ ) shall be less than:

$$T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify\_NR} + T_{SI\_NR} + T_{RACH}$$

The target NR cell shall be considered detetable when for each relevant SSB, the side conditions should be met that,

- SSB\_RP and SSB £s/Iot according to Annex B.2.5 for a corresponding NR Band.

 $T_{RRC\_procedure\_delay}$ : It is the RRC procedure delay for processing the received message "RRCRelease" as defined in clause 6.2.2 of TS 38.331 [2].

 $T_{identify-NR}$ : It is the time to identify the target NR cell and depends on the frequency range (FR) of the target NR cell. It is defined in table 6.2.3.2.1-1. Note that  $T_{identify-NR} = T_{PSS/SSS-sync} + T_{meas}$ , in which  $T_{PSS/SSS-sync}$  is the cell search time and  $T_{meas}$  is the measurement time due to cell selection criteria evaluation.

 $T_{SI-NR}$ : It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

 $T_{RACH}$ : It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in Table 6.3.3.2-2 [6] or Table 6.3.3.2-3 [6] for FR1 and in Table 6.3.3.2-4 [6] for FR2.

 $T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise  $T_{rs}$  is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with  $T_{rs} = 20$  ms assuming the SSB transmission periodicity is not larger than 20 ms,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 6.2.3.2.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

Frequency range (FR) of target NR cell		Tidentify-NR
FR1		MAX (680 ms, [11] x T <sub>rs</sub> )
FR2		MAX (880 ms, 8x[11] x T <sub>rs</sub> )
Note:	If the UE has been provided with higher layer signaling of smtc2 specified in TS 38.331 [2] prior to the	
	redirection command, T <sub>rs</sub> follows <i>smtc1</i> or <i>smtc2</i> according to the physical cell ID of the target cell.	

## 6.2.3.2.2 RRC connection release with redirection to E-UTRAN

The UE shall be capable of performing the RRC connection release with redirection to the target E-UTRAN cell within  $T_{connection\_release\_redirect\_E-UTRAN}$ .

The time delay ( $T_{connection\_release\_redirect\_E-UTRA}$ ) is the time between the end of the last slot containing the RRC command, "RRCRelease" (TS 38.331 [2]) on the PDSCH and the time the UE starts to send random access to the target E-UTRA cell. The time delay ( $T_{connection\_release\_redirect\_E-UTRA}$ ) shall be less than:

$$T_{connection\_release\_redirect\_E-UTRA} = T_{RRC\_procedure\_delay} + T_{identify-E-UTRA} + T_{SI-E-UTRA} + T_{RACH}$$

The target E-UTRA FDD or TDD cell shall be considered detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in annex B.1.2 of TS 36.133 [15] are fulfilled for a corresponding Band, and
- the same conditions as for inter-frequency RSRQ measurements specified in annex B.1.2 of TS 36.133 [15] are fulfilled for a corresponding Band.
- SCH conditions specified in annex B.1.2 of TS 36.133 [15] are fulfilled for a corresponding Band.

 $T_{RRC\_procedure\_delay}$ : It is the RRC procedure delay for processing the received message "RRCRelease" as defined in clause 6.2.2 of TS 38.331 [2].

Tidentify-E-UTRA: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

 $T_{SI\text{-}E\text{-}UTRA}$ : It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released.

 $T_{RACH}$ : It is the delay caused due to the random access procedure when sending random access to the target E-UTRA cell.

# 7 Timing

# 7.1 UE transmit timing

## 7.1.1 Introduction

The UE shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place  $(N_{TA} + N_{TA}) \times T_c$  before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. For serving cell(s) in PTAG, UE shall use the SpCell as the reference cell for deriving the UE transmit timing for cells in the PTAG. For serving cell(s) in STAG, UE shall use any of the activated SCells as the reference cell for deriving the UE transmit timing for the cells in the STAG. UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are defined in the following requirements.

## 7.1.2 Requirements

The UE initial transmission timing error shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is specified in Table 7.1.2-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus  $(N_{\rm TA} + N_{\rm TA~offset}) \times T_{\rm c}$ . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell.  $N_{\rm TA}$  for PRACH is defined as 0.

 $(N_{\rm TA} + N_{\rm TA~offset}) \times T_c$  (in  $T_c$  units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied.  $N_{\rm TA}$  for other channels is not changed until next timing advance is received. The value of  $N_{\rm TA~offset}$  depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR).  $N_{\rm TA~offset}$  is defined in Table 7.1.2-2.

3\*64\*Tc

3\*64\*Tc

2

Note 1:

SCS of uplink Frequency SCS of SSB Te Range signals (KHz) signals s(KHz) 12\*64\*Tc 15 30 10\*64\*T<sub>c</sub> 15 60 10\*64\*Tc 1 15 8\*64\*Tc 8\*64\*Tc 30 30 7\*64\*Tc 60 60 3.5\*64\*T<sub>c</sub> 120 3.5\*64\*T<sub>c</sub> 120

60

120

Table 7.1.2-1: Te Timing Error Limit

Table 7.1.2-2: The Value of  $N_{\rm TA~offset}$ 

T<sub>c</sub> is the basic timing unit defined in TS 38.211 [6]

240

Frequency range and band of cell used for uplink transmission	N <sub>TA offset</sub> (Unit: Tc)
FR1 FDD band without LTE-NR coexistence case or	25600 (Note 1)
FR1 TDD band without LTE-NR coexistence case	
FR1 FDD band with LTE-NR coexistence case	0 (Note 1)
FR1 TDD band with LTE-NR coexistence case	39936 (Note 1)
FR2	13792

Note 1: The UE identifies  $N_{\mathrm{TA~offset}}$  based on the information n-TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of  $N_{\mathrm{TA~offset}}$  is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of  $N_{\mathrm{TA~offset}}$  can also be provided for a FDD serving cell.

Note 2: Void

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 7.3 is applied.

Table 7.1.2-3: void

## 7.1.2.1 Gradual timing adjustment

When the transmission timing error between the UE and the reference timing exceeds  $\pm T_e$  then the UE is required to adjust its timing to within  $\pm T_e$ . The reference timing shall be  $(N_{TA} + N_{TA \text{ offset}}) \times T_c$  before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

- 1) The maximum amount of the magnitude of the timing change in one adjustment shall be Tq.
- 2) The minimum aggregate adjustment rate shall be  $T_p$  per second.
- 3) The maximum aggregate adjustment rate shall be  $T_q$  per 200 ms.

where the maximum autonomous time adjustment step  $T_q$  and the aggregate adjustment rate  $T_p$  are specified in Table 7.1.2.1-1.

Table 7.1.2.1-1: T<sub>q</sub> Maximum Autonomous Time Adjustment Step and T<sub>p</sub> Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	Tq	Тр
	15	5.5*64*T <sub>c</sub>	5.5*64*T <sub>c</sub>
1	30	5.5*64*T <sub>c</sub>	5.5*64*T <sub>c</sub>
	60	5.5*64*T <sub>c</sub>	5.5*64*T <sub>c</sub>
2	60	2.5*64*T <sub>c</sub>	2.5*64*T <sub>c</sub>
	120	2.5*64*T <sub>c</sub>	2.5*64*T <sub>c</sub>
NOTE: T <sub>c</sub> is the basic timing unit defined in TS 38.211 [6]			

## 7.1.2.2 One shot timing adjustment

When the magnitude of the  $\Delta T$  exceeds H then the UE shall adjust its transmission timing in one adjustment only once provided that the following conditions are met at the UE. Otherwise when the the magnitude of the  $\Delta T \leq H$  then the UE shall adjust its transmission timing according to the rules defined in clause 7.1.2.1.

- SSB\_RP and SSB Ês/Iot according to Annex B.2.6.1 for a corresponding operating Band,

The UE transmit timing immediately after applying the one shot timing adjustment shall be:  $T_2 - (N_{TA} + N_{TA \text{ offset}}) + 2 \times (T_1 - T_2)$ . After applying the one shot timing adjustment the UE shall adjust its transmission timing according to the rules defined in clause 7.1.2.1.

Where:  $\Delta T = |T_1 - T_2|$ 

- T<sub>1</sub> is the reception time at the UE just before the one shot timing adjustment,
- T<sub>2</sub> is the reception time to be used at the UE just after the one shot timing adjustment,
- H is defined in table 7.1.2.2-1.

Table 7.1.2.2-1: The value of H

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals s(KHz)	H [Tc]
		15	TBD
	15	30	TBD
4		60	TBD
l	30	15	TBD
		30	TBD
		60	TBD
2	120	60	TBD
	120	120	TBD
2	0.40	60	TBD
240		120	TBD

# 7.2 UE timer accuracy

## 7.2.1 Introduction

UE timers are used in different protocol entities to control the UE behaviour.

## 7.2.2 Requirements

For UE timers specified in TS 38.331 [2], the UE shall comply with the timer accuracies according to Table 7.2.2-1.

The requirements are only related to the actual timing measurements internally in the UE. They do not include the following:

- Inaccuracy in the start and stop conditions of a timer (e.g. UE reaction time to detect that start and stop conditions of a timer is fulfilled), or
- Inaccuracies due to restrictions in observability of start and stop conditions of a UE timer (e.g. slot alignment when UE sends messages at timer expiry).

**Table 7.2.2-1** 

Timer value [s]	Accuracy
timer value < 4	± 0.1s
timer value ≥ 4	± 2.5%

# 7.3 Timing advance

## 7.3.1 Introduction

The timing advance is initiated from gNB to UE in EN-DC, NR-DC, NE-DC and NR SA operation modes,, with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [7].

## 7.3.2 Requirements

## 7.3.2.1 Timing Advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot n+k+1 for a timing advance command received in time slot n, and the value of k is defined in clause 4.2 in TS 38.213 [3]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

## 7.3.2.2 Timing Advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 7.3.2.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [3].

Table 7.3.2.2-1: UE Timing Advance adjustment accuracy

UL Sub Carrier Spacing, SCS kHz	15	30	60	120
UE Timing Advance adjustment accuracy	±256 T <sub>c</sub>	±256 T <sub>c</sub>	±128 T <sub>c</sub>	±32 T <sub>c</sub>

# 7.4 Cell phase synchronization accuracy

## 7.4.1 Definition

Cell phase synchronization accuracy for TDD is defined as the maximum absolute deviation in frame start timing between any pair of cells on the same frequency that have overlapping coverage areas.

# 7.4.2 Minimum requirements

The cell phase synchronization accuracy measured at BS antenna connectors shall be better than  $3 \mu s$ .

## 7.5 Maximum Transmission Timing Difference

## 7.5.1 Introduction

A UE shall be capable of handling a relative transmission timing difference between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell to be aggregated for EN-DC operation.

A UE shall be capable of handling a relative transmission timing difference among slot timing boundaries of different carriers to be aggregated in NR carrier aggregation.

## 7.5.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1.

Table 7.5.2-1 Maximum uplink transmission timing difference requirement for asynchronous EN-DC

Sub-carrier spacing in E-UTRA PCell (kHz)	UL Sub-carrier spacing for data in PSCell (kHz)	Maximum uplink transmission timing difference (µs)
15	15	500
15	30	250
15	60	125
15	120 <sup>Note1</sup>	62.5

NOTE 1: For E-UTRA FDD-NR FDD and E-UTRA TDD-NR TDD intra-band EN-DC, for which the requirement is defined in clause 7.5.3 and this Table 7.5.2-1 is also applicable, the scenario with 120kHz PSCell does not exist.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-2. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

Table 7.5.2-2 Maximum uplink transmission timing difference requirement for inter-band synchronous EN-DC

Sub-carrier spacing in E- UTRA PCell (kHz)	UL Sub-carrier spacing for data in PSCell (kHz)	Maximum uplink transmission timing difference (µs)	
15	15	35.21	
15	30	35.21	
15	60	35.21	
15	120	35.21	
NOTE 1: Void			

## 7.5.3 Minimum Requirements for intra-band EN-DC

For intra-band EN-DC, only co-located deployment is applied.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1 for E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is capable of asynchronous EN-DC operation [16]..

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.3-1 for E-UTRA TDD-NR TDD and E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is only capable of synchronous EN-DC operation [16]

Table 7.5.3-1: Maximum uplink transmission timing difference requirement for intra-band synchronous EN-DC

Sub-carrier spacing in E-UTRA PCell (kHz)	UL Sub-carrier spacing for data in PSCell (kHz)	Maximum uplink transmission timing difference (µs)
15	15	5.21 <sup>Note1</sup>
15	30	5.21
15	60	5 21

NOTE 1: This is not applicable for a UE which indicates the capability of only supporting single UL timing (*ul-TimingAlignmentEUTRA-NR* is signalled). Single UL timing for E-UTRA and NR cell is assumed for this UE.

Editot's Note: UE transmit signal quality degradation could be expected if the maximum transmit time difference exceeds a certain threshold. The threshold and how to specify corresponding requirements is FFS.

## 7.5.4 Minimum Requirements for NR Carrier Aggregation

The UE shall be capable of handling at least a relative transmission timing difference between slot timing of different TAGs as shown in Table 7.5.4-1, provided that the UE is:

- configured with the pTAG and the sTAG for inter-band NR carrier aggregation in SA or NR-DC mode, or
- configured with more than one sTAG for inter-band NR carrier aggregation in EN-DC or NE-DC mode.

Table 7.5.4-1: Maximum transmission timing difference requirement for inter-band NR carrier aggregation

Frequency Range	Maximum transmission timing difference (µs)
FR1	34.6
FR2	8.5
Between FR1 and FR2	26.1

# 7.5.5 Minimum Requirements for inter-band NE-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between NR PCell and PSCell as shown in Table 7.5.5-1.

Table 7.5.5-1: Maximum uplink transmission timing difference requirement for asynchronous NE-DC

Sub-carrier spacing in NR PCell (kHz)		
15	15	500
30	15	250
60	15	125
120 <sup>Note1</sup>	15	62.5

NOTE 1: For NR FDD- E-UTRA FDD and NR TDD- E-UTRA TDD intra-band NE-DC, for which the requirement is defined in clause [7.5.X] and this Table 7.5.5-1 is also applicable, the scenario with 120kHz PCell does not exist.

The UE shall be capable of handling a maximum uplink transmission timing difference between NR PCell and PSCell as shown in Table 7.5.5-2. The requirements for synchronous NE-DC are applicable for NR TDD- E-UTRA TDD, NR FDD- E-UTRA FDD and NR FDD- E-UTRA TDD inter-band NE-DC.

Table 7.5.5-2: Maximum uplink transmission timing difference requirement for inter-band synchronous NE-DC

Sub-carrier spacing in NR PCell (kHz)	UL Sub-carrier spacing for data in PSCell (kHz)	Maximum uplink transmission timing difference (µs)
15	15	35.21
30	15	35.21
60	15	35.21
120	15	35.21
NOTE 1: Void		

Editor Note: It is FFS the necessity of inter-band NE-DC synchronous requirement for MTTD.

## 7.5.6 Minimum Requirements for inter-band NR-NR DC

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and PSCell as shown in Table 7.5.6-1 provided that the UE indicates that it is capable of synchronous NR-NR DC [16].

Table 7.5.6-1: Maximum transmission timing difference requirement for inter-band NR-NR synchronous dual connectivity

Frequency Range		Maximum transmission timing
PCell	PSCell	difference (µs)
FR1	FR2	34.1

# 7.6 Maximum Receive Timing Difference

## 7.6.1 Introduction

A UE shall be capable of handling a relative receive timing difference between subframe timing boundary of a E-UTRA cell belonging to the MCG and slot timing boundary of a cell belonging to SCG to be aggregated for EN-DC operation.

A UE shall be capable of handling a relative receive timing difference between slot timing boundary of a cell belonging to MCG and subframe timing boundary of a E-UTRA cell belonging to the SCG to be aggregated for NE-DC operation.

A UE shall be capable of handling a relative receive timing difference between slot timing boundary of a cell belonging to MCG and slot timing boundary of a cell belonging to the SCG to be aggregated for NR DC operation. A UE shall be capable of handling a relative receive timing difference among slot timing boundaries of different carriers to be aggregated in NR carrier aggregation.

# 7.6.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver as shown in Table 7.6.2-1.

Table 7.6.2-1: Maximum receive timing difference requirement for asynchronous EN-DC

Sub-carrier spacing of E-UTRA cell in MCG (kHz)	DL Sub-carrier spacing of cell in SCG (kHz) (Note 1)	Maximum receive timing difference (µs)
15	15	500
15	30	250
15	60	125
15	120 <sup>Note2</sup>	62.5

NOTE 1: DL Sub-carrier spacing is min{SCS<sub>SS</sub>, SCS<sub>DATA</sub>}.

NOTE 2: For E-UTRA FDD-NR FDD and E-UTRA TDD-NR TDD intra-band EN-DC, for which the requirement is defined in clause 7.6.3 and this Table 7.6.2-1 is also applicable, the scenario with 120 kHz does not exit.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver as shown in Table 7.6.2-2. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

Table 7.6.2-2: Maximum receive timing difference requirement for inter-band synchronous EN-DC

Sub-carrier spacing of E-UTRA cell in MCGPCell (kHz)	DL Sub-carrier spacing of cell in SCG (kHz) (Note1)	Maximum receive timing difference (μs)	
15	15		
15	30	22	
15	60	33	
15	120		
NOTE 1: DL Sub-carrier spacing is min{SCSss, SCSDATA}.			
NOTE 2: Void			

**Table 7.6.2-3 Void** 

## 7.6.3 Minimum Requirements for intra-band EN-DC

For intra-band EN-DC, only collocated deployment is applied.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG as shown in Table 7.6.2-1 for E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is capable of asynchronous EN-DC operation [16].

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG as shown in Table 7.6.3-1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD and E-UTRA FDD-NR FDD intra-band EN-DC.

Table 7.6.3-1 Maximum receive timing difference requirement for intra-band synchronous EN-DC

Sub-carrier spacing of E-UTRA cell in MCG (kHz)	DL Sub-carrier spacing of cell in SCG (kHz) <sup>Note1</sup>	Maximum receive timing difference (µs)	
15	15	3	
15	30	3	
15	60	3	
NOTE 1: DL Sub-carrier spacing is min{SCSss. SCSDATA}.			

#### Table 7.6.3-2 Void

## 7.6.4 Minimum Requirements for NR Carrier Aggregation

For intra-band CA, only co-located deployment is applied. For intra-band non-contiguous NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference between slot timing of different carriers to be aggregated at the UE receiver as shown in Table 7.6.4-1 below.

Table 7.6.4-1: Maximum receive timing difference requirement for intra-band non-contiguous NR carrier aggregation

Frequency Range	Maximum receive timing difference (µs)
FR1	3
FR2	0.26

Editot's Note: there could be UE performance degradation for some UE implementations when the relative receiving timing difference is greater than a threshold for downlink SCS higher than 15KHz in FR1. How to specify this requirement is FFS.

For inter-band NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference between slot timing of different carriers to be aggregated at the UE receiver as shown in Table 7.6.4-2 below.

Table 7.6.4-2: Maximum receive timing difference requirement for inter-band NR carrier aggregation

Frequency Range	Maximum receive timing difference (µs)
FR1	33
FR2	8
Between FR1 and FR2	25

# 7.6.5 Minimum Requirements for inter-band NE-DC

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from a E-UTRA cell belonging to the SCG at the UE receiver for asynchronous NE-DC as shown in Table 7.6.5-1.

Table 7.6.5-1: Maximum receive timing difference requirement for asynchronous NE-DC

Sub-carrier spacing of cell in MCG (kHz)	DL Sub-carrier spacing of EUTRA cell in SCG (kHz) (Note 1)	Maximum receive timing difference (μs)
15	15	500
30	15	250
60	15	125
120 <sup>Note2</sup>	15	62.5

NOTE 1: DL Sub-carrier spacing is min{SCS<sub>SS</sub>, SCS<sub>DATA</sub>}.

NOTE 2: For NR FDD- E-UTRA FDD and NR TDD- E-UTRA TDD intra-band NE-DC, for which the requirement is defined in clause [7.6.X] and this Table 7.6.5-1 is also applicable, the scenario with 120 kHz does not exit.

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from a E-UTRA cell belonging to the SCG at the UE receiver for inter-band synchronous NE-DC as shown in Table 7.6.5-2. The requirements for synchronous NE-DC are applicable for NR TDD- E-UTRA TDD, NR TDD- E-UTRA FDD, NR TDD- E-UTRA FDD and NR FDD- E-UTRA TDD interband NE-DC.

Table 7.6.5-2: Maximum receive timing difference requirement for inter-band synchronous NE-DC

Sub-carrier spacing of cell in MCG (kHz)	DL Sub-carrier spacing of EUTRA cell in SCG (kHz) (Note1)	Maximum receive timing difference (µs)
15	15	
30	15	33
60	15	
120	15	
NOTE 1: DL Sub-carrier spacing is min{SCS <sub>SS</sub> , SCS <sub>DATA</sub> }.		
NOTE 2: Void		

Editor Note: It is FFS the necessity of inter-band NE-DC synchronous requirement for MRTD.

## 7.6.6 Minimum Requirements for inter-band NR DC

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG at the UE receiver as shown in Table 7.6.6-1 provided that the UE indicates that it is capable of synchronous NR-NR DC [16].

Table 7.6.6-1: Maximum receive timing difference requirement for inter-band NR-NR synchronous dual connectivity

Frequency Range		Maximum receive timing
Cell in	Cell in	difference (µs)
MCG	SCG	
FR1	FR2	33

## 7.7 deriveSSB-IndexFromCell tolerance

## 7.7.1 Minimum requirements

When *deriveSSB-IndexFromCell* is enabled, the UE assumes frame boundary alignment (including half frame, subframe and slot boundary alignment) across cells on the same frequency carrier is within a tolerance not worse than min(2 SSB symbols, 1 PDSCH symbol) and the SFN of all cells on the same frequency carrier are the same.

## **7.8** Void

# 8 Signalling characteristics

# 8.1 Radio Link Monitoring

## 8.1.1 Introduction

The requirements in clause 8.1 apply for radio link monitoring on any of:

- PCell in SA NR, NR-DC and NE-DC operation mode,
- PSCell in NR-DC and EN-DC operation mode.

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [3]. The configured

RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds  $Q_{out}$  and  $Q_{in}$  for the purpose of monitoring downlink radio link quality of the cell.

The threshold  $Q_{out}$  is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate (BLER<sub>out</sub>) as defined in Table 8.1.1-1. For SSB based radio link monitoring,  $Q_{out\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.2.1-1. For CSI-RS based radio link monitoring,  $Q_{out\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.3.1-1.

The threshold  $Q_{in}$  is defined as the level at which the downlink radio link quality can be significantly more reliably received than at  $Q_{out}$  and shall correspond to the in-sync block error rate (BLER<sub>in</sub>) as defined in Table 8.1.1-1. For SSB based radio link monitoring,  $Q_{in\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.2.1-2. For CSI-RS based radio link monitoring,  $Q_{in\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.3.1-2.

The out-of-sync block error rate (BLER<sub>out</sub>) and in-sync block error rate (BLER<sub>in</sub>) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 8.1.1-1 as default. All requirements in clause 8.1 are applicable for BLER Configuration #0 in Table 8.1.1-1.

Table 8.1.1-1: Out-of-sync and in-sync block error rates

Configuration	BLERout	BLERin
0	10%	2%

UE shall be able to monitor up to  $N_{RLM}$  RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number  $L_{max}$  of candidate SSBs per half frame according to TS 38.213 [3], where  $N_{RLM}$  is specified in Table 8.1.1-2, and meet the requirements as specified in clause 8.1. UE is not required to meet the requirements in clause 8.1 if RLM-RS is not configured and no TCI state for PDCCH is activated.

Table 8.1.1-2: Maximum number of RLM-RS resources NRLM

Maximum number of RLM- RS resources, N <sub>RLM</sub>	$L_{ m max}$	Carrier frequency range of PCell/PSCell	
2	4	FR1, ≤ 3 GHz <sup>Note</sup>	
4	8	FR1, > 3 GHz <sup>Note</sup>	
8 64		FR2	
	for unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 2.4GHz, as specified in clause 4.1 in TS 38.213 [3].		

If different SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB shall be TDMed. If same SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB can be FDMed or TDMed.

## 8.1.2 Requirements for SSB based radio link monitoring

## 8.1.2.1 Introduction

The requirements in this section apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.1.2.2.

Table 8.1.2.1-1: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (MHz)	24
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

Table 8.1.2.1-2: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (MHz)	24
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

## 8.1.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_out\_SSB}}$  [ms] period becomes worse than the threshold  $Q_{\text{out\_SSB}}$  within  $T_{\text{Evaluate\_out\_SSB}}$  [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_in\_SSB}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_SSB}}$  within  $T_{\text{Evaluate\_in\_SSB}}$  [ms] evaluation period.

 $T_{Evaluate\_out\_SSB}$  and  $T_{Evaluate\_in\_SSB}$  are defined in Table 8.1.2.2-1 for FR1.

 $T_{Evaluate\_out\_SSB}$  and  $T_{Evaluate\_in\_SSB}$  are defined in Table 8.1.2.2-2 for FR2 with N=8.

#### For FR1,

- P=1/(1 T<sub>SSB</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2.

- $P=1/(1-T_{SSB}/T_{SMTCperiod})$ , when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC period (T<sub>SSB</sub> = T<sub>SMTCperiod</sub>).
- P is  $1/(1-T_{SSB}/MGRP-T_{SSB}/T_{SMTCperiod})$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{SSB}/MGRP)*3$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5*T_{SMTCperiod}$
- P is  $1/\{1-T_{SSB}/min(T_{SMTCperiod},MGRP)\}$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T<sub>SSB</sub> /MGRP)\*3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion (T<sub>SSB</sub> = T<sub>SMTCperiod</sub>) and SMTC occasion is partially overlapped with measurement gap (T<sub>SMTCperiod</sub> < MGRP)</li>

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, T<sub>SMTCperiod</sub> follows *smtc2*; Otherwise T<sub>SMTCperiod</sub> follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 8.1.2.2-1: Evaluation period T<sub>Evaluate out SSB</sub> and T<sub>Evaluate in SSB</sub> for FR1

Configuration	T <sub>Evaluate_out_SSB</sub> (ms)	T <sub>Evaluate_in_SSB</sub> (ms)	
no DRX	max(200,ceil(10*P)*Tssb)	max(100,ceil(5*P)*T <sub>SSB</sub> )	
DRX cycle≤320	max(200,ceil(15*P)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	max(100,ceil(7.5*P)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
DRX cycle>320 ceil(10*P)*T <sub>DRX</sub> ceil(5*P)*T <sub>DRX</sub>			
NOTE: Tssb is the periodicity of SSB configured for RLM. Tdrx is the DRX cycle length.			

Table 8.1.2.2-2: Evaluation period T<sub>Evaluate\_out\_SSB</sub> and T<sub>Evaluate\_in\_SSB</sub> for FR2

Configuration T <sub>Evaluate_out_SSB</sub> (ms)		T <sub>Evaluate_in_SSB</sub> (ms)	
no DRX	max(200,ceil(10*P*N)*T <sub>SSB</sub> )	max(100,ceil(5*P*N)*T <sub>SSB</sub> )	
DRX cycle≤320	max(200,ceil(15*P*N)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	max(100,ceil(7.5*P*N)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
DRX cycle>320 ceil(10*P*N)*T <sub>DRX</sub> ceil(5*P*N)*T <sub>DRX</sub>			
NOTE: T <sub>SSB</sub> is the periodicity of SSB configured for RLM. T <sub>DRX</sub> is the DRX cycle length.			

#### 8.1.2.3 Measurement restrictions for SSB based RLM

The UE is required to be capable of measuring SSB for RLM without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,

- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
- If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

For FR2, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

## 8.1.3 Requirements for CSI-RS based radio link monitoring

### 8.1.3.1 Introduction

The requirements in this section apply for each CSI-RS based RLM-RS resource configured for PCell or PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

Table 8.1.3.1-1: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	4dB
Bandwidth (MHz)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

Table 8.1.3.1-2: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	[0]dB
Bandwidth (MHz)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

## 8.1.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_out\_CSI-RS}}$  [ms] period becomes worse than the threshold  $Q_{\text{out\_CSI-RS}}$  within  $T_{\text{Evaluate\_out\_CSI-RS}}$  [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_in\_CSI-RS}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_CSI-RS}}$  within  $T_{\text{Evaluate\_in\_CSI-RS}}$  [ms] evaluation period.

- T<sub>Evaluate out CSI-RS</sub> and T<sub>Evaluate in CSI-RS</sub> are defined in Table 8.1.3.2-1 for FR1.
- TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS are defined in Table 8.1.3.2-2 for FR2 with N=1. The requirements of TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements doesn't apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

#### For FR1,

- P=1/(1 T<sub>CSI-RS</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

#### For FR2,

- P=1, when RLM-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1-T_{CSI-RS}/MGRP)$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- $P=1/(1-T_{CSI-RS}/T_{SMTCperiod})$ , when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ).
- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ).
- P is  $1/(1-T_{CSI-RS}/MGRP-T_{CSI-RS}/T_{SMTCperiod})$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion (TCSI-RS  $< T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{CSI-RS}/MGRP)*3$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- P is  $1/\{1-T_{CSI-RS} / min(T_{SMTCperiod}, MGRP)\}$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T<sub>CSI-RS</sub> /MGRP)\* 3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion (T<sub>CSI-RS</sub> = T<sub>SMTCperiod</sub>) and SMTC occasion is partially overlapped with measurement gap (T<sub>SMTCperiod</sub> < MGRP)</li>

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, T<sub>SMTCperiod</sub> follows *smtc2*; Otherwise T<sub>SMTCperiod</sub> follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of  $M_{\text{out}}$  and  $M_{\text{in}}$  used in Table 8.1.3.2-1 and Table 8.1.3.2-2 are defined as:

-  $M_{out} = 20$  and  $M_{in} = 10$ , if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth  $\geq 24$  PRBs.

Table 8.1.3.2-1: Evaluation period T<sub>Evaluate out CSI-RS</sub> and T<sub>Evaluate in CSI-RS</sub> for FR1

Configuration	T <sub>Evaluate_out_</sub> CSI-RS (ms)	T <sub>Evaluate_in_CSI-RS</sub> (ms)		
no DRX	max(200, ceil(M <sub>out</sub> ×P)×T <sub>CSI-RS</sub> )	max(100, ceil(M <sub>in</sub> ×P) × T <sub>CSI-RS</sub> )		
DRX ≤ 320ms	max(200, ceil(1.5×M <sub>out</sub> ×P)×	$max(100, ceil(1.5 \times M_{in} \times P) \times max(T_{DRX}, T_{CSI}$		
	max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	RS))		
DRX > 320ms	$ceil(M_{out} \times P) \times T_{DRX}$ $ceil(M_{in} \times P) \times T_{DRX}$			
NOTE: T <sub>CSI-RS</sub> is the	NOTE: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply			
for T <sub>CSI-RS</sub> eq	for $T_{CSI-RS}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $\bar{T}_{DRX}$ is the DRX cycle length.			

Table 8.1.3.2-2: Evaluation period  $T_{Evaluate\_out\_CSI-RS}$  and  $T_{Evaluate\_in\_CSI-RS}$  for FR2

Configuration	T <sub>Evaluate_out_CSI-RS</sub> (ms)	T <sub>Evaluate_in_CSI-RS</sub> (ms)	
no DRX	max(200, ceil(Mout×P×N)×Tcsi-Rs)	max(100, ceil(M <sub>in</sub> ×P×N) × T <sub>CSI-RS</sub> )	
DRX ≤ 320ms	max(200, ceil(1.5×M <sub>out</sub> ×P×N)×	max(100, ceil(1.5×M <sub>in</sub> ×P×N)×	
	max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	
DRX > 320ms	$ceil(M_{out} \times P \times N) \times T_{DRX}$	$ceil(M_{in} \times P \times N) \times T_{DRX}$	
NOTE: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for			
T <sub>CSI-RS</sub> equal to 5 ms, 10 ms, 20 ms or 40 ms. T <sub>DRX</sub> is the DRX cycle length.			

### 8.1.3.3 Measurement restrictions for CSI-RS based RLM

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or

- The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

## 8.1.4 Minimum requirement at transitions

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of themonitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of themonitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

## 8.1.5 Minimum requirement for UE turning off the transmitter

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

## 8.1.6 Minimum requirement for L1 indication

When the downlink radio link quality on all the configured RLM-RS resources is worse than  $Q_{out}$ , Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than  $Q_{in}$ , Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least  $T_{Indication\_interval}$ .

When DRX is not used  $T_{Indication\_interval}$  is max(10ms,  $T_{RLM-RS,M}$ ), where  $T_{RLM,M}$  is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to  $T_{SSB}$  specified in clause 8.1.2 if the RLM-RS resource is SSB, or  $T_{CSI-RS}$  specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used,  $T_{Indication\_interval}$  is max(10ms, 1.5\*DRX\_cycle\_length, 1.5\* $T_{RLM-RS,M}$ ) if DRX cycle\_length is less than or equal to 320ms, and  $T_{Indication\_interval}$  is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

# 8.1.7 Scheduling availability of UE during radio link monitoring

When the reference signal to be measured for RLM has different subcarrier spacing than PDSCH/PDCCH and on frequency range FR2, there are restrictions on the scheduling availability as described in the following clauses.

# 8.1.7.1 Scheduling availability of UE performing radio link monitoring with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

# 8.1.7.2 Scheduling availability of UE performing radio link monitoring with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on SSB symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR1 is performed, the scheduling restrictions on FR1 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When inter-band carrier aggregation within FR1 is performed, there are no scheduling restrictions on FR1 serving cell(s) in the bands due to radio link monitoring performed on FR1 serving PCell or PSCell in different bands.

## 8.1.7.3 Scheduling availability of UE performing radio link monitoring on FR2

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH/PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

# 8.1.7.4 Scheduling availability of UE performing radio link monitoring on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR-DC

There are no scheduling restrictions on FR1 serving cell(s) due to radio link monitoring performed on FR2 serving PCell and/or PSCell.

There are no scheduling restrictions on FR2 serving cell(s) due to radio link monitoring performed on FR1 serving PCell and/or PSCell.

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

# 8.2 Interruption

## 8.2.1 EN-DC Interruption

### 8.2.1.1 Introduction

This section contains the requirements related to the interruptions on PSCell, and SCell, when

E-UTRA PCell transitions between active and non-active during DRX, or

E-UTRA PCell transitions from non-DRX to DRX, or

E-UTRA SCell in MCG or SCell in SCG is added or released, or

E-UTRA SCell in MCG or SCell in SCG is activated or deactivated, or

measurements on SCC with deactivated SCell in either E-UTRA MCG or NR SCG, or

a supplementary UL carrier or an UL carrier is configured or de-configured, or

UL/DL BWP is switched on PSCell or SCell in SCG.

The requirements shall apply for E-UTRA-NR DC with an E-UTRA PCell.

This section contains interruptions where victim cell is PSCell or SCell belonging to SCG. Requirements for interruptions requirements when the victim cell is E-UTRA PCell or E-UTRA SCell belonging to MCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gaps, interruptions to the PSCell or activated SCG SCells may be caused by EUTRA PCell, EUTRA SCells or SCells on any frequency range. For UE which support per-FR gaps, interruptions to the PSCell or activated SCG SCells may be caused by EUTRA PCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

## 8.2.1.2 Requirements

## 8.2.1.2.1 Interruptions at transitions between active and non-active during DRX

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active druing DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.1.2.1-1.

Table 8.2.1.2.1-1: Interruption length X at transition between active and non-active during DRX

,, NR Slot		Interruption length X		
"	length (ms)	Sync	Async	
0	1	1	2	
1	0.5	1	2	
2	0.25	3		
3	0.125	5		

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

### 8.2.1.2.2 Interruptions at transitions from non-DRX to DRX

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions from non-DRX to DRX when PSCell or SCell is in non-DRX shall not exceed X slot as defined in table 8.2.1.2.1-1.

When PSCell and the activated SCell are in DRX, no interruption due to E-UTRA PCell transitions from non-DRX to DRX is allowed.

## 8.2.1.2.3 Interruptions at SCell addition/release

The requirements in this clause shall apply for the UE configured with PSCell.

When one E-UTRA SCell in MCG is added or released:

- the UE is allowed an interruption on any activae serving cell in SCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being added or released, or

of up to max{Y1 slot + T<sub>SMTC\_duration</sub>, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being added or released are available in the same slot, where T<sub>SMTC\_duration</sub> is the longest SMTC duration among all above active serving cells in SCG;

Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

When one SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to Y1 slot + T<sub>SMTC\_duration</sub> if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, T<sub>SMTC\_duration</sub> is
    - the longest SMTC duration among all above active serving cells in SCG and the SCell being added when one SCell is added;
    - the longest SMTC duration among all above active serving cells in SCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.1.2.3-2.

Table 8.2.1.2.3-1: Interruption length X1 and Y1 at E-UTRA SCell addition/Release

μ	NR Slot length		n length X1 lot	Interruption I	ength Y1 slot
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	2	3	2	3
2	0.25	:	5	4	5
3	0.125	9		8	9

Table 8.2.1.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

μ	NR Slot length (ms) of victim cell	Interruption length X1 slot		Interruption length Y1 slot
0	1	1		1
1	0.5	2		2
2	0.25	Both aggressor cell and 4 victim cell are on FR2		4
		Either aggressor cell or victim cell is on FR1	5	
3	0.125	Aggressor cell is on FR2 8		8
		Aggressor cell is on FR1	9	

## 8.2.1.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with PSCell and one SCell.

When one E-UTRA SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or
- of up to  $max\{Y2 \text{ slot} + T_{SMTC\_duration}, 5ms\}$  if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells

and the E-UTRA SCells being activated or deactivated are available in the same slot, where  $T_{SMTC\_duration}$  is the longest SMTC duration among all above active serving cells in SCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

When one SCell in SCG is activated or deactivated:

- an interruption on any serving cell in SCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
  - of up to Y2 slot +  $T_{SMTC\_duration}$  if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where,  $T_{SMTC\_duration}$  is
    - the longest SMTC duration among all above active serving cells in SCG and the SCell being activated when one SCell is activated;
    - the longest SMTC duration among all above active serving cells in SCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.1.2.4-2.

Table 8.2.1.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

μ	NR Slot length	Interruption length X2 slot		Interruption I	ength Y2 slot
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25	;	3	2	3
3	0.125		5	4	5

Table 8.2.1.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

μ	NR Slot length (ms) of victim cell	Interruption length X2 slot		Interruption length Y2 slot
0	1	1		1
1	0.5	1		1
2	0.25	Both aggressor cell and victim cell are on FR2	2	2
		Either aggressor cell or victim cell is on FR1	3	
3	0.125	Aggressor cell is on FR2 4		4
		Aggressor cell is on FR1	5	

## 8.2.1.2.5 Interruptions during measurements on SCC

#### 8.2.1.2.5.1 Interruptions during measurements on deactivated NR SCC

Interruption on PSCell and other activated NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

## 8.2.1.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells is 640 ms or longer.

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [15].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or
- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 8.2.1.2.5.2-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length	Interruption length X3 slot		Interruption len	gth Y3 slot <sup>Note 1</sup>
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25	3		2	3
3	0.125		5	4	5

## 8.2.1.2.6 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NR non-standalone operation as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or deconfigured, an interruption of up to X4 slot, is allowed during the RRC reconfiguration procedure [2] on E-UTRA PCell, all activated E-UTRA SCells, PSCell and all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of E-UTRA PCell, all activated E-UTRA SCells, PSCell and all activated SCells within the same FR as the configured or de-configured UL.

Table 8.2.1.2.6-1: Interruption length X4 at UL carrier RRC reconfiguration

//	NR Slot	Interruption length X4 slot		
"	length (ms)	Sync	Async	
0	1	1	2	
1	0.5	2	3	
2	0.25	5	5	
3	0.125	Ç	)	

### 8.2.1.2.7 Interruption due to Active BWP switching Requirement

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only

allowed within the BWP switching delay  $T_{BWPswitchDelay}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The interruption is only allowed within the delay  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  defined in clause 8.6.3.

Table 8.2.1.2.7-1: interruption length X

μ	NR Slot length (ms)	Interruption length X (slots <sup>note 1</sup> )	
0	1	1	
1	0.5	1	
2	0.25	3	
3	0.125	5	
Note1:	If the BWP switch involves changing of SCS, the interruption due to BWP switch is determined by the larger one between the SCS before BWP switch and the SCS after the BWP switch.		

Table 8.2.1.2.7-2: Parameters which cause interruption other than SCS

Parameters	Comment	
locationAndBandwidth	From TC 20 224 [2]	
nrofSRS-Ports	From TS 38.331 [2]	
Editor's note: More parameters can be added if identified		

# 8.2.2 SA: Interruptions with Standalone NR Carrier Aggregation

## 8.2.2.1 Introduction

This clause contains the requirements related to the interruptions on PCell and activated SCell if configured, when

up to 7 SCells are configured, deconfigured, activated or deactivated, or

a supplementary UL carrier or an UL carrier is configured or de-configured, or

measurements on SCC with deactivated SCell in NR SCG, or

UL/DL BWP is switched on PCell or SCell.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

Editor's Note: The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure [2] for SCell addition/release or MAC control signalling [17] for SCell activation/deactivation command. How to specify this is FFS.

This clause additionally contains requirements related to interruptions at inter-frequency SFTD between PCell in FR1 and neighbour cell in FR2.

For a UE which does not support per-FR measurement gaps, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For UE which support per-FR gaps, interruptions to PCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

## 8.2.2.2 Requirements

## 8.2.2.2.1 Interruptions at SCell addition/release

When any number of SCells between one and 7 is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any active serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.2.2.1-1, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to the duration shown in table 8.2.2.2.1-2, if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

Table 8.2.2.2.1-1: Interruption duration for SCell addition/release for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruptio	on length (slot)	
0	1		1	
1	0.5		2	
2	0.25	Both aggressor cell and victim cell are on FR2	4	
		Either aggressor cell or victim cell is on FR1	5	
3	0.125	Aggressor cell is on FR2	8	
		Aggressor cell is on FR1	9	
Note:	lote: Tsmtc_duration is - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added; - the longest SMTC duration among all active serving cells in the same band when one SCell is released.			

Table 8.2.2.2.1-2: Interruption duration for SCell addition/release for intra-band CA

μ	NR Slot length (ms)	Interruption length (slot)
0	1	1 + T <sub>SMTC_duration</sub>
1	0.5	2 + T <sub>SMTC_duration</sub>
2	0.25	4 + T <sub>SMTC_duration</sub>
3	0.125	8 + T <sub>SMTC_duration</sub>
Note:	Tsmtc_duration is  - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added;  - the longest SMTC duration among all active serving cells in the same band when one SCell is released.	

## 8.2.2.2.2 Interruptions at SCell activation/deactivation

When an intra-band SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.2.2.2-1, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or

- of up to the duration shown in table 8.2.2.2.2-2, if the active serving cells are in the same band as any of the SCells being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

Table 8.2.2.2.2-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruption length (slot)		
0	1		1	
1	0.5		1	
2	0.25	Both aggressor cell and victim cell are on FR2	2	
		Either aggressor cell or victim cell is on FR1	3	
3	0.125	Aggressor cell is on FR2	4	
		Aggressor cell is on FR1	5	
Note:	Note: T <sub>SMTC_duration</sub> is - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added; - the longest SMTC duration among all active serving cells in the same band when one SCell is released.			

Table 8.2.2.2.2: Interruption duration for SCell activation/deactivation for intra-band CA

μ	NR Slot	Interruption length	
μ	length (ms)	-	
0	1	1 + T <sub>SMTC_duration</sub>	
1	0.5	1 + T <sub>SMTC_duration</sub>	
2	0.25	2 + T <sub>SMTC_duration</sub>	
3	0.125	4 + T <sub>SMTC_duration</sub>	
- 6 1	the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is		
-	activated; - the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated.		

## 8.2.2.2.3 Interruptions during measurements on SCC for intra-band CA

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on activated SCells due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1 if the activated SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 if the activated SCell is in the same band as the deactivated SCell.

## 8.2.2.2.4 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NR standalone carrier aggregation as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or deconfigured, an interruption of up to the duration shown in table 8.2.2.2.4-1, is allowed during the RRC reconfiguration procedure [2] on PCell and all activated SCells

within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of PCell and all the activated SCells within the same FR as the configured or de-configured UL.

Table 8.2.2.2.4-1: Interruption duration for UL carrier RRC reconfiguration

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	2
2	0.25	4
3	0.125	8

## 8.2.2.2.5 Interruption due to Active BWP switching Requirement

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.2.5-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{BWPswitchDelay}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When a BWP timer bwp-InactivityTimer defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{BWPswitchDelay}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The interruption is only allowed within the delay  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  defined in clause 8.6.3.

Table 8.2.2.2.5-1: Interruption length X

μ	NR Slot length (ms)	Interruption length X (slots <sup>note 1</sup> )	
0	1	1	
1	0.5	1	
2	0.25	3	
3	0.125	5	
Note1:	If the BWP switch involves changing of SCS, the interruption due to BWP switch is determined by the larger one between the SCS before BWP switch and the SCS after the BWP switch.		

Table 8.2.2.2.5-2: Parameters which cause interruption other than SCS

Parameters	Comment				
locationAndBandwidth	From TC 20 224 [2]				
nrofSRS-Ports	From TS 38.331 [2]				
Editor's note: More parameters can be added if identified					

## 8.2.2.2.6 Interruptions at inter-frequency SFTD measurement

The requirements in this clause concern interruptions on PCell in FR1, as well as on activated SCells in MCG, when the UE is performing SFTD measurements on inter-frequency neighbour cell(s) in FR1 or FR2. The following requirements apply when no PSCell is configured.

For a UE with per-FR gap capability:

- for neighbour cell in FR1:
  - the percentage of interrupted slots on uplink and downlink during the SFTD measurement period T<sub>measure SFTD1</sub> specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1.
  - the length of each interruption shall not exceed the number of slots specified in Table 8.2.2.2.6-2.
- for neighbour cell in FR2:
  - no interruptions are allowed during the SFTD measurement period T<sub>measure\_SFTD1</sub> specified in Clause 9.3.8.

For a UE with per-UE gap capability:

- for neighbour cell in FR1:
  - the percentage of interrupted slots on uplink and downlink during the SFTD measurement period T<sub>measure SFTD1</sub> specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1.
  - the length of each interruption shall not exceed the number of slots specified in Table 8.2.2.2.6-2.
- for neighbour cell in FR2:
  - the percentage of interrupted slots on uplink and downlink during the SFTD measurement period T<sub>measure SFTD1</sub> specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-3.
  - the length of each interruption shall not exceed the number of slots specified in Table 8.2.2.2.6-4.

Table 8.2.2.2.6-1: Requirements on maximum percentage of interrupted slots in FR1 serving cell in inter-frequency SFTD with neighbour cell in FR1

SFTD	Serving	Neighbour cell SMTC periodicity					
configuration	<b>cell</b> µ	5ms	10ms	20ms	40ms	80ms	160ms
With RSRP	0	[8.4%]	[11.6%]	[6.8%]	[4.7%]	[3.7%]	[3.2%]
report	1						
	2	1					
Without RSRP	0	[11.4%]	[8.6%]	[5.7%]	[4.6%]	[4.1%]	[3.8%]
report	1						
	2						

Table 8.2.2.2.6-2: Interruption duration for FR1 serving cell in inter-frequency SFTD with neighbour cell in FR1

μ	NR Slot length (ms)	Interruption length (slots)
0	1	[1]
1	0.5	[2]
2	0.25	[4]

Table 8.2.2.2.6-3: Requirements on maximum percentage of interrupted slots in FR1 serving cell in inter-frequency SFTD with neighbour cell in FR2

SFTD	Serving	Neighbour cell SMTC periodicity					
configuration	<b>cell</b> μ	5ms	10ms	20ms	40ms	80ms	160ms
With RSRP	0	[8.4%]	[11.6%]	[6.8%]	[4.7%]	[3.7%]	[3.2%]
report	1	[4.2%]	[5.8%]	[3.4%]	[2.4%]	[1.8%]	[1.6%]
	2	[4.2%]	[5.8%]	[3.4%]	[2.4%]	[1.8%]	[1.6%]
Without RSRP	0	[11.4%]	[8.6%]	[5.7%]	[4.6%]	[4.1%]	[3.8%]
report	1	[5.7%]	[4.3%]	[2.9%]	[2.3%]	[2.1%]	[1.9%]
	2	[5.7%]	[4.3%]	[2.9%]	[2.3%]	[2.1%]	[1.9%]

Table 8.2.2.2.6-4: Interruption duration for FR1 serving cell in inter-frequency SFTD with neighbour cell in FR2

μ	NR Slot length (ms)	Interruption length (slots)		
0	1	[1]		
1	0.5	[1]		
2	0.25	[2]		

# 8.2.3 NE-DC Interruptions

## 8.2.3.1 Introduction

This section contains the requirements related to the interruptions on PCell and SCell, when

E-UTRA PSCell transitions between active and non-active during DRX, or

E-UTRA PSCell transitions from non-DRX to DRX, or

E-UTRA PSCell/SCell in SCG or SCell in MCG is added or released, or

E-UTRA PSCell/SCell in SCG or SCell in MCG is activated or deactivated, or

measurements on SCC with deactivated SCell in either E-UTRA SCG or NR MCG or

PUSCH/PUCCH carrier configuration and deconfiguration in NR MCG, or

UL/DL BWP is switched on PCell or SCell in MCG.

The requirements shall apply for NE-DC with an NR PCell.

This section contains interruptions where victim cell is PCell or SCell belonging to MCG, or E-UTRA PSCell or E-UTRA SCell belonging to SCG. Requirements for interruptions requirements when the victim cell is E-UTRA PSCell or E-UTRA SCell belonging to SCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gaps, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on any frequency range. For UE which

support per-FR gaps, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

## 8.2.3.2 Requirements

## 8.2.3.2.1 Interruptions at transitions between active and non-active during DRX

Interruption on PCell and the activated SCell if configured due to E-UTRA PSCell transitions between active and non-active druing DRX when PCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PSCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.3.2.1-1.

Each interruption shall not exceed X slot as defined in table 8.2.3.2.1-1.

Table 8.2.3.2.1-1: Interruption length X at transition between active and non-active during DRX

//	NR Slot	Interruption length X			
A	length (ms)	Sync	Async		
0	1	1	2		
1	0.5	1	2		
2	0.25	3			
3	0.125	5			

When both PCell and E-UTRA PSCell are in DRX, no interruption is allowed.

## 8.2.3.2.2 Interruptions at transitions from non-DRX to DRX

Interruption on PCelland the activated SCell if configured due to E-UTRA PSCell transitions from non-DRX to DRX when PCell or SCell is in non-DRX shall not exceed X slot as defined in table 8.2.3.2.1-1.

## 8.2.3.2.3 Interruptions at PSCell/SCell addition/release

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell.

When one E-UTRA PSCell/SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA PSCell/SCells being added or released, or
  - of up to max{Y1 slot + T<sub>SMTC\_duration</sub>, 5ms} if the active serving cells are in the same band as any of the E-UTRA PSCell/SCells being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA PSCell/SCells being added or released are available in the same slot, where T<sub>SMTC\_duration</sub> is the longest SMTC duration among all above activated serving cells in MCG;

Where X1 and Y1 are specified in Table 8.2.3.2.3-1.

When one SCell in MCG is added or released:

- the UE is allowed an interruption on any activated serving cell in MCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to Y1 slot +  $T_{SMTC\_duration}$  if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where,  $T_{SMTC\_duration}$  is
    - the longest SMTC duration among all above active serving cells in MCG and the SCell being added when one SCell is added:

- the longest SMTC duration among all above active serving cells in MCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.3.2.3-2.

Table 8.2.3.2.3-1: Interruption length X1 and Y1 at E-UTRA PSCell/SCell addition/release

μ	NR Slot length	Interruption length X1 slot		Interruption I	ength Y1 slot
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	2	3	2	3
2	0.25	5		4	5
3	0.125	9		8	9

Table 8.2.3.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

μ	NR Slot length (ms) of victim cell	Interruption length X1	slot	Interruption length Y1 slot
0	1	1		1
1	0.5	2		2
2	0.25	Both aggressor cell and 4 victim cell are on FR2		4
		Either aggressor cell or victim cell is on FR1	5	
3	0.125	Aggressor cell is on FR2 8		8
		Aggressor cell is on FR1	9	

## 8.2.3.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell and one SCell.

When one E-UTRA SCell in SCG is activated or deactivated:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or
- of up to max{Y2 slot + T<sub>SMTC\_duration</sub>, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where T<sub>SMTC\_duration</sub> is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

When one SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any serving cell in MCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
  - of up to Y2 slot +  $T_{SMTC\_duration}$  if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where,  $T_{SMTC\_duration}$  is
    - the longest SMTC duration among all above active serving cells in MCGand the SCell being activated when one SCell is activated;
    - the longest SMTC duration among all above active serving cells in MCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.3.2.4-2.

Table 8.2.3.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

μ	NR Slot length		n length X2 lot	Interruption I	ength Y2 slot
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25		3	2	3
3	0.125		5	4	5

Table 8.2.3.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

μ	NR Slot length (ms) of victim cell	Interruption length X2 slot		Interruption length Y2 slot
0	1	1		1
1	0.5	1		1
2	0.25	Both aggressor cell and victim cell are on FR2	2	2
		Either aggressor cell or victim cell is on FR1	3	
3	0.125	Aggressor cell is on FR2	4	4
		Aggressor cell is on FR1	5	

### 8.2.3.2.5 Interruptions during measurements on SCC

## 8.2.3.2.5.1 Interruptions during measurements on deactivated NR SCC

Interruption on PCell and other activated SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3.

### 8.2.3.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

When one E-UTRA SCell in SCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [15].

### Each interruption shall not exceed

- X3 slot, if the PCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or
- Y3 slot + SMTC duration, if the PCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Where X3 and Y3 are specified in Table 8.2.3.2.5-1

Table 8.2.3.2.5-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length		n length X3 lot	Interruption len	igth Y3 slot <sup>Note 1</sup>
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25		3	2	3
3	0.125		5	4	5

### 8.2.3.2.6 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NE-DC.

When an UL carrier or supplementary UL carrier is configured or deconfigured, an interruption of up to X4 slot as specified in Table 8.2.3.2.6-1, is allowed during the RRC reconfiguration procedure [2] on PCell, all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of PCell, all activated within the same FR as the configured or de-configured UL.

Table 8.2.3.2.6-1: Interruption length X4 at UL carrier RRC reconfiguration

//	NR Slot	Interruption length X4 slot	
μ	length (ms)	Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	5
3	0.125	Ç	)

## 8.2.3.2.7 Interruption due to Active BWP switching Requirement

When UE receives a DCI indicating the UE to switch its active BWP, or when a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, or when the UE receives an RRC command indicating the UE to switch its active BWP, the UE is allowed an interruption on PCell and any activated SCells as defined in clause 8.2.2.2.5.

# 8.2.4 NR-DC: Interruptions

### 8.2.4.1 Introduction

This section contains the requirements related to the interruptions on PCell, PSCell and activated SCell if configured, when

up to TBD SCells are configured, deconfigured, activated or deactivated deactivated or,

a supplementary UL carrier or an UL carrier is configured or de-configured, or

measurements on SCC with deactivated SCell in NR SCG, or

UL/DL BWP is switched on PCell, PSCell or SCell.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

Editor's Note: The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure [2] for SCell addition/release or MAC control signalling [17] for SCell activation/deactivation command. How to specify this is FFS.

The requirements shall apply for NR-DC with an NR PCell, PSCell or SCell.

For a UE which does not support per-FR measurement gaps, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For UE which support per-FR gaps, interruptions to PCell, PSCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

## 8.2.4.2 Requirements

## 8.2.4.2.1 Interruptions at PSCell/SCell addition/release

When PSCell or any number of SCells between one and TBD is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any activated serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.4.2.1-1, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to the duration shown in table 8.2.4.2.1-2, if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

Table 8.2.4.2.1-1: Interruption duration for PSCell/SCell addition/release for inter-band DC/CA

μ	NR Slot length (ms) of victim cell	Interruption	on length (slot)
0	1		1
1	0.5		2
2	0.25	Both aggressor cell and victim cell are on FR2	4
		Either aggressor cell or victim cell is on FR1	5
3	0.125	Aggressor cell is on FR2	8
		Aggressor cell is on FR1	9
Note:	T <sub>SMTC_duration</sub> is - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added; - the longest SMTC duration among all active serving cells in the same band when one SCell is released.		

Table 8.2.4.2.1-2: Interruption duration for SCell addition/release for intra-band DC/CA

μ	NR Slot length (ms)	Interruption length (slot)
0	1	1 + T <sub>SMTC_duration</sub>
1	0.5	2 + T <sub>SMTC_duration</sub>
2	0.25	4 + T <sub>SMTC_duration</sub>
3	0.125	8 + T <sub>SMTC_duration</sub>
Note:	T <sub>SMTC_duration</sub> is - the longest SMTC duration among all above activeserving cells and the SCell being added when one SCell is added; - the longest SMTC duration among all active serving cells in the same band when one SCell is released.	

### 8.2.4.2.2 Interruptions at SCell activation/deactivation

When a SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:

- of up to the duration shown in table 8.2.4.2.2-1, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
- of up to the duration shown in table 8.2.4.2.2-2, if the active serving cells are in the same band as any of the SCells being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

Table 8.2.4.2.2-1: Interruption duration for SCell activation/deactivation for inter-band DC/CA

μ	NR Slot length (ms) of victim cell	Interruption length	
0	1	1	
1	0.5	1	
2	0.25	Both aggressor cell and victim cell are on FR2	2
		Either aggressor cell or victim cell is on FR1	3
3	0.125	Aggressor cell is on FR2 4	
		Aggressor cell is on FR1	5

Table 8.2.4.2.2-2: Interruption duration for SCell activation/deactivation for intra-band DC/CA

μ	NR Slot	Interruption length	
μ	length (ms)	_	
0	1	1 + T <sub>SMTC_duration</sub>	
1	0.5	1 + T <sub>SMTC_duration</sub>	
2	0.25	2 + T <sub>SMTC_duration</sub>	
3	0.125	4 + T <sub>SMTC_duration</sub>	
Note:	SMTC_duration is		
_	the longest SMT	C duration among all	
		ing cells and the SCell	
k	eing activated wl	hen one SCell is	
a	activated;		
-	the longest SMT	C duration among all	
a	active serving cells in the same band when		
	one SCell is deac	tivated.	

# 8.2.4.2.3 Interruptions during measurements on SCC

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on activated SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1 if the activated SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2-2 if the activated SCell is in the same band as the deactivated SCell.

# 8.2.4.2.4 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NR-DC as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or deconfigured, an interruption of up to the duration shown in table 8.2.4.2.4-1, is allowed during the RRC reconfiguration procedure [2] on all the other activated serving

cells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of all the other serving cells within the same FR as the configured or de-configured UL.

Table 8.2.4.2.4-1: Interruption duration for UL carrier RRC reconfiguration

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	2
2	0.25	4
3	0.125	8

# 8.2.4.2.5 Interruption due to Active BWP switching Requirement

When UE receives a DCI indicating the UE to switch its active BWP, or when a BWP timer bwp-InactivityTimer defined in TS 38.331 [2] expires, or when the UE receives an RRC command indicating the UE to switch its active BWP, the UE is allowed to cause an interruption on any other serving cells as defined in clause 8.2.2.2.5.

# 8.3 SCell Activation and Deactivation Delay

## 8.3.1 Introduction

This section defines requirements for the delay within which the UE shall be able to activate a deactivated SCell and deactivate an activated SCell in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC.

The requirements shall apply for EN-DC, standalone NR carrier aggregation, NE-DC, and NR-DC.

# 8.3.2 SCell Activation Delay Requirement for Deactivated SCell

The requirements in this section shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot n, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot n+ [ $T_{HARQ}$  +  $T_{activation\_time}$  +  $T_{CSI\_Reporting}$ ], where:

T<sub>HARQ</sub> is the timing between DL data transmission and acknowledgement as specified in TS 38.321 [7].

 $T_{activation\_time}$  is the SCell activation delay.

If the SCell is known and belongs to FR1, Tactivation\_time is:

- [T<sub>SMTC SCell</sub> + 5ms], if the SCell measurement cycle is equal to or smaller than [160ms].
- $[T_{SMTC\_MAX} + T_{SMTC\_SCell} + 5ms]$ , if the SCell measurement cycle is larger than [160ms].

If the SCell is unknown and belongs to FR1, Tactivation\_time is:

-  $[2*T_{SMTC\_MAX} + 2*T_{SMTC\_SCell} + 5ms]$  provided the SCell can be successfully detected on the first attempt.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, provided that the SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in clause 3.6.3,  $T_{activation\_time}$  is  $[T_{SMTC\_SCell} + 5ms]$ .

If the SCell being activated belongs to FR2 and there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, T<sub>activation\_time</sub> is 3 ms.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

- If the target SCell is known to UE, Tactivation time is:
  - [T<sub>MAC-CE,SCell</sub> + T<sub>FineTiming</sub> + 2ms], if UE receives the SCell activation command and TCI state activation command at the same time.
  - $[max{T_{MAC-CE,SCell}, T_{uncertainty}} + T_{MAC-CE\_TCI} + T_{FineTiming} + 2ms]$ , if UE receives TCI state activation command after SCell activation command.
- If the target SCell is unknown to UE:
  - $\left[T_{MAC\text{-CE,SCell}} + 24*T_{SMTC\_SCell} + T_{L1\text{-RSRP,measure}} + T_{L1\text{-RSRP,report}} + T_{uncertainty} + T_{MAC\text{-CE,TCI}} + T_{FineTiming} + \left[T_{CS1\text{-RS\_resource\_configuration}}\right] + 2ms\right]$

Note 1: T<sub>MAC-CE,SCell</sub>, T<sub>MAC-CE,TCl</sub>, and [T<sub>CSI-RS\_resource\_configuration</sub>] shall be determined in RAN4#92 meeting.

#### Where,

### T<sub>SMTC\_MAX</sub>:

- In FR1, in case of intra-band SCell activation, T<sub>SMTC\_MAX</sub> is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, T<sub>SMTC\_MAX</sub> is the SMTC periodicity of SCell being activated.
- In FR2, T<sub>SMTC\_MAX</sub> is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.
- T<sub>SMTC MAX</sub> is bounded to a minimum value of 10ms.

T<sub>SMTC</sub> <sub>SCell</sub>: SMTC periodicity of SCell being activated and the minimum value is 10ms.

 $T_{\text{MAC-CE\_TCI}}$  is the time for TCI activation for PDSCH and PDCCH.

T<sub>MAC-CE-SCell</sub> is the MAC-CE decoding time for SCell activation.

T<sub>FineTiming</sub> is the time period between UE finish decoding the last MAC CE message and the timing of first complete available SSB corresponding to the TCI state. For unknown case, the requirement is only defined provided that the MAC CE for PDCCH TCI, MAC CE for PDSCH TCI and MAC CE for CSI-RS CQI reporting is after the L1-RSRP measurement reporting.

 $T_{uncertainty}$  is the time period between reception of SCell activation MAC-CE and TCI activation MAC-CE for known case. For unknown case, uncertainty is the time between the first L1-RSRP reporting and when UE receives TCI activation MAC-CE.

T<sub>L1-RSRP,measure</sub> is L1-RSRP measurement delay as defined in clause 9.5 assuming M=1.

T<sub>L1-RSRP,report</sub> is L1-RSRP reporting delay as defined in clause 9.5.

 $[T_{CSI\text{-RS\_resource\_configuration}}] \ is \ the \ time \ for \ CSI\text{-RS} \ resource \ configuration \ for \ CQI \ reporting.$ 

T<sub>CSI\_reporting</sub> is the delay including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max([5] measCycleSCell, [5] DRX cycles) for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2 and 9.3.

- the SSB measured during the period equal to max([5] measCycleSCell, [5] DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to [4s] for UE supporting power class1 and [3s] for UE supporting power class 2/3/4 before UE receives MAC-CE command for TCI activation:
  - the UE has sent a valid L3-RSRP measurement report with index
  - SCell activation command is assumed to be received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in clauses 9.2 and 9.3, and the TCI state is selected based on one of the reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the activation command, T<sub>SMTC\_Scell</sub> follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. T<sub>SMTC\_MAX</sub> follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [2] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in clause 8.2 shall not occur before slot  $n+1+[T_{HARQ}]$  and not occur after slot  $n+1+[T_{HARQ}+3ms+T_{SMTC\_MAX}+T_{SMTC\_duration}]$ .

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in clause 8.2 shall not occur before slot  $n+1+[T_{HARQ}]$  and not occur after slot  $n+1+[T_{HARQ}+3ms+T_{SMTC\_MAX}+T_{SMTC\_duration}]$ .

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

# 8.3.3 SCell Deactivation Delay Requirement for Activated SCell

The requirements in this section shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC.

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot n, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot  $n+[T_{\text{HARO}} + 3\text{ms}]$ .

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in clause 8.2 shall not occur before slot  $n+1+[T_{HARO}]$  and not occur after slot  $n+1+[T_{HARO}+3ms]$ .

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in clause 8.2 shall not occur before slot  $n+1+[T_{HARO}]$  and not occur after slot  $n+1+[T_{HARO}+3ms]$ .

# 8.4 UE UL carrier RRC reconfiguration Delay

## 8.4.1 Introduction

The requirements in this section apply for a UE being configured or deconfigured with a supplementary UL carrier or NR UL carrier.

# 8.4.2 UE UL carrier configuration Delay Requirement

When the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within  $T_{UL\_carrier\_config}$  from the end of the last slot containing the RRC command.

T<sub>UL\_carrier\_config</sub> equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

# 8.4.3 UE UL carrier deconfiguration Delay Requirement

When the UE receives a RRC message implying NR UL or Supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within  $T_{UL\_carrier\_deconfig}$  from the end of the last slot containing the RRC command.

T<sub>UL carrier deconfig</sub> equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

# 8.5 Link Recovery Procedures

### 8.5.1 Introduction

The UE shall assess the downlink link quality of a serving cell based on the reference signal in the set  $\bar{q}_0$  as specified in TS 38.213 [3] in order to detect beam failure instance for any of:

- PCell in SA, NR-DC, or NE-DC operation mode,
- PSCell in NR-DC and EN-DC operation mode,

The RS resource configurations in the set  $\bar{q}_0$  can be periodic CSI-RS resources and/or SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in clause 8.5.2 and 8.5.3 if UE does not have set  $\bar{q}_0$ .

On each RS resource configuration in the set  $\overline{q}_0$ , the UE shall estimate the radio link quality and compare it to the threshold  $Q_{\text{out\_LR}}$  for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold  $Q_{\text{out\_LR}}$  is defined as the level at which the downlink radio level link of a given resource configuration on set  $\overline{q}_0$  cannot be reliably received and shall correspond to the BLER<sub>out</sub>=10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection,  $Q_{\text{out\_LR\_SSB}}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.2.1-1. For CSI-RS based beam failure detection,  $Q_{\text{out\_LR\_CSI-RS}}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.3.1-1.

Upon request the UE shall deliverconfiguration indexes from the set  $\overline{q}_1$  as specified in TS 38.213 [3], to higher layers, and the correspondingL1-RSRP measurement provided that that the measured L1-RSRP is equal to or better than the threshold  $Q_{in,LR}$ , which is indicated by higher layer parameter rsrp-ThresholdSSB. The UE applies the  $Q_{in,LR}$  threshold to the L1-RSRP measurement obtained from a SSB. The UE applies the  $Q_{in,LR}$  threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter powerControlOffsetSS. The RS resource configurations in the set  $\overline{q}_1$  can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources. UE is not required to perform candidate beam detection outside the active DL BWP.

# 8.5.2 Requirements for SSB based beam failure detection

### 8.5.2.1 Introduction

The requirements in this section apply for each SSB resource in the set  $\overline{q}_0$  configured for a serving cell, provided that the SSB configured for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.2.2.

Table 8.5.2.1-1: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (MHz)	TBD
Sub-carrier spacing (kHz)	Same as the SCS of RMSI CORESET
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

# 8.5.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set  $\overline{q}_0$  estimated over the last  $T_{\text{Evaluate\_BFD\_SSB}}$  [ms] period becomes worse than the threshold  $Q_{\text{out\_LR\_SSB}}$  within  $T_{\text{Evaluate\_BFD\_SSB}}$  [ms] period.

The value of T<sub>Evaluate\_BFD\_SSB</sub> is defined in Table 8.5.2.2-1 for FR1.

The value of T<sub>Evaluate BFD SSB</sub> is defined in Table 8.5.2.2-2 for FR2 with N=8

### For FR1,

- P=1/(1 T<sub>SSB</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB;
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

### For FR2,

- $P=1/(1-T_{SSB}/T_{SMTCperiod})$ , when BFD-RS is not overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- P is  $P_{sharing\ factor}$ , when BFD-RS is not overlapped with measurement gap and BFD-RS is fully overlapped with SMTC period ( $T_{SSB} = T_{SMTCperiod}$ ).
- P is 1/(1- T<sub>SSB</sub>/MGRP T<sub>SSB</sub>/T<sub>SMTCperiod</sub>), when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (T<sub>SSB</sub> < T<sub>SMTCperiod</sub>) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP \text{ and } T_{SSB} < 0.5*T_{SMTCperiod}$

- P is  $1/(1-T_{SSB}/MGRP)^*$  P<sub>sharing factor</sub>, when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5^*T_{SMTCperiod}$
- P is 1/{1-T<sub>SSB</sub> /min (T<sub>SMTCperiod</sub> ,MGRP)}, when BFD-RS is partially overlapped with measurement gap (T<sub>SSB</sub> <MGRP) and BFD-RS is partially overlapped with SMTC occasion (T<sub>SSB</sub> < T<sub>SMTCperiod</sub>) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is  $1/(1-T_{SSB}/MGRP)*P_{sharing\ factor}$ , when BFD-RS is partially overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{\text{sharing factor}} = 3$ .

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 8.5.2.2-1: Evaluation period T<sub>Evaluate BFD SSB</sub> for FR1

Configuration	T <sub>Evaluate_BFD_SSB</sub> (ms)	
no DRX	max([50], ceil(5*P)*T <sub>SSB</sub> )	
DRX cycle ≤ 320ms	max([50], ceil(7.5*P)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
DRX cycle > 320ms	ceil(5*P)*T <sub>DRX</sub>	
Note: T <sub>SSB</sub> is the periodicity of SSB in the set $\overline{q}_0$ . T <sub>DRX</sub> is the DRX cycle length.		

Table 8.5.2.2-2: Evaluation period T<sub>Evaluate\_BFD\_out</sub> for FR2

Configuration	T <sub>Evaluate_BFD_SSB</sub> (ms)	
no DRX	max([50], ceil(5*P*N)*T <sub>SSB</sub> )	
DRX cycle ≤ 320ms	max([50], ceil(7.5*P*N)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
DRX cycle > 320ms	ceil(5*P*N)*T <sub>DRX</sub>	
Note: T <sub>SSB</sub> is the periodicity of SSB in the set $\overline{q}_0$ . T <sub>DRX</sub> is the DRX cycle length.		

## 8.5.2.3 Measurement restriction for SSB based beam failure detection

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

For FR2, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

# 8.5.3 Requirements for CSI-RS based beam failure detection

### 8.5.3.1 Introduction

The requirements in this section apply for each CSI-RS resource in the set  $\overline{q}_0$  of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set  $\overline{q}_0$  for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.3.2. UE is not expected to perform beam failure detection measurements on the CSI-RS configured as BFD-RS if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP.

Table 8.5.3.1-1: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	0dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

# 8.5.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set  $\overline{q}_0$  estimated over the last  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  [ms] period becomes worse than the threshold  $Q_{\text{out\_LR\_CSI-RS}}$  within  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  [ms] period.

The value of T<sub>Evaluate BFD CSI-RS</sub> is defined in Table 8.5.3.2-1 for FR1.

The value of  $T_{Evaluate\_BFD\_CSI-RS}$  is defined in Table 8.5.3.2-2 for FR2 with N=1. The requirements of  $T_{Evaluate\_BFD\_CSI-RS}$  apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON.

### For FR1,

- P=1/(1 T<sub>CSI-RS</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

### For FR2,

- P=1, when BFD-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1-T_{CSI-RS}/MGRP)$ , when BFD-RS is partially overlapped with measurement gap and BFD-RS is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- P=1/(1 T<sub>CSI-RS</sub> /T<sub>SMTCperiod</sub>), when BFD-RS is not overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (T<sub>CSI-RS</sub> < T<sub>SMTCperiod</sub>).
- P is  $P_{sharing\ factor}$ , when BFD-RS is not overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ).

- P is 1/(1- T<sub>CSI-RS</sub> /MGRP T<sub>CSI-RS</sub> /T<sub>SMTCperiod</sub>), when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion (TCSI-RS < T<sub>SMTCperiod</sub>) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{CSI-RS}/MGRP)*P_{sharing\ factor}$ , when BFD-RS is partially overlapped with measurement gap and BFD-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- P is  $1/\{1-T_{CSI-RS}/min(T_{SMTCperiod},MGRP)\}$ , when BFD-RS is partially overlapped with measurement gap ( $T_{CSI-RS} < MGRP$ ) and BFD-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is  $1/(1-T_{CSI-RS}/MGRP)*P_{sharing\ factor}$ , when BFD-RS is partially overlapped with measurement gap and BFD-RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- P<sub>sharing factor</sub> is 3.

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M<sub>BFD</sub> used in Table 8.5.3.2-1 and Table 8.5.3.2-2 are defined as

-  $M_{BFD} = 10$ , if the CSI-RS resource(s) in set  $\overline{q}_0$  used for BFD is transmitted with Density = 3.

Table 8.5.3.2-1: Evaluation period T<sub>Evaluate BFD CSI-RS</sub> for FR1

Configuration	T <sub>Evaluate_BFD_CSI-RS</sub> (ms)	
no DRX	max([50], [M <sub>BFD</sub> *P] * T <sub>CSI-RS</sub> )	
DRX cycle ≤ 320ms	max([50], [1.5×M <sub>BFD</sub> *P]*max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	
DRX cycle > 320ms	[M <sub>BFD</sub> *P] * T <sub>DRX</sub>	
Note: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource in the set $\overline{q}_0$ . T <sub>DRX</sub> is the		
DRX cycle length.		

Table 8.5.3.2-2: Evaluation period  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  for FR2

Configuration	TEvaluate_BFD_CSI-RS (ms)	
no DRX	max([50], [M <sub>BFD</sub> *P*N] * T <sub>CSI-RS</sub> )	
DRX cycle ≤ 320ms	max([50], [1.5×M <sub>BFD</sub> *P*N]*max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	
DRX cycle > 320ms	[MBFD *P*N] * TDRX	
Note: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource in the set $\overline{q}_0^{}$ . T <sub>DRX</sub> is the		
DRX cycle length.		

### 8.5.3.3 Measurement restrictions for CSI-RS beam failure detection

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

For FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for BFD measurement and the other CSI-RS. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.
  - The CSI-RS for BFD measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

# 8.5.4 Minimum requirement for L1 indication

When the radio link quality on all the RS resources in set  $\overline{q}_0$  is worse than  $Q_{\text{out\_LR}}$ , Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [2].

The beam failure instance evaluation for the RS resources in set  $\overline{q}_0$  shall be performed as specified in clause 6 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least  $T_{Indication\_interval\_BFD}$ .

When DRX is not used,  $T_{Indication\_interval\_BFD}$  is max(2ms,  $T_{SSB-RS,M}$ ) or max(2ms,  $T_{CSI-RS,M}$ ), where  $T_{SSB-RS,M}$  and  $T_{CSI-RS,M}$  is the shortest periodicity of all RS resources in set  $\overline{q}_0$  for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set  $\overline{q}_0$  or CSI-RS resource in the set  $\overline{q}_0$ .

When DRX is used,  $T_{Indication\_interval\_BFD}$  is max(1.5\*DRX\_cycle\_length, 1.5\* $T_{SSB-RS,M}$ ) if DRX cycle\_length is less than or equal to 320ms for SSB based link quality measurement, and  $T_{Indication\_interval}$  is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms.

When DRX is used,  $T_{Indication\_interval\_BFD}$  is max $(1.5*DRX\_cycle\_length, 1.5*T_{CSI-RS,M})$  if DRX cycle\_length is less than or equal to 320ms for CSI-RS based link quality measurement, and  $T_{Indication\_interval}$  is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms.

# 8.5.5 Requirements for SSB based candidate beam detection

### 8.5.5.1 Introduction

The requirements in this section apply for each SSB resource in the set  $\overline{q}_1$  configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.5.2.

# 8.5.5.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set  $\bar{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_SSB}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_LR}}$  provided SSB\_RP and SSB Ês/Iot are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 8.5.5.2-1 and 8.5.5.2-2 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq$  320ms.

The value of  $T_{Evaluate\_CBD\_SSB}$  is defined in Table 8.5.5.2-1 for FR1.

The value of T<sub>Evaluate CBD SSB</sub> is defined in Table 8.5.5.2-2 for FR2 with N=8.

Where,

### For FR1.

- P=1/(1 T<sub>SSB</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

## For FR2,

- $P=1/(1-T_{SSB}/T_{SMTCperiod})$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- P is 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period ( $T_{SSB} = T_{SMTCperiod}$ ).
- P is 1/(1- T<sub>SSB</sub>/MGRP T<sub>SSB</sub>/T<sub>SMTCperiod</sub>), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T<sub>SSB</sub> < T<sub>SMTCperiod</sub>) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP \ and \ T_{SSB} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{SSB}/MGRP)*3$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5*T_{SMTCperiod}$
- P is  $1/\{1-T_{SSB}/min\ (T_{SMTCperiod}\ ,MGRP)\}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- P is  $1/(1-T_{SSB}/MGRP)*3$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )

Table 8.5.5.2-1: Evaluation period T<sub>Evaluate\_CBD\_SSB</sub> for FR1

Con	figuration T <sub>Evaluate_CBD_SSB</sub> (ms)			
non-DR	RX, DRX cycle	ceil([3]*P) * T <sub>SSB</sub>		
\$	320ms			
DRX c	ycle > 320ms	ceil([3]*P) * T <sub>DRX</sub>		
Note:	T <sub>SSB</sub> is the pe	eriodicity of SSB in the set $\;\overline{q}_{\!\scriptscriptstyle 1}$ . $T_{DRX}$ is the DRX cycle		
	length.			

Table 8.5.5.2-2: Evaluation period T<sub>Evaluate\_CBD\_out</sub> for FR2

Con	figuration	T <sub>Evaluate_CBD_SSB</sub> (ms)
non-DF	RX, DRX cycle	ceil([3]*P*N) * Tssb
\$	≨ 320ms	
DRX c	ycle > 320ms	ceil([3]*P*N) * T <sub>DRX</sub>
Note:	$T_{SSB}$ is the periodicity of SSB in the set $\ \overline{q}_{l}$ . $T_{DRX}$ is the DRX cycle	
	length.	

### 8.5.5.3 Measurement restriction for SSB based candidate beam detection

For FR1, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for CBD measurement without any restrictions:
- If SSB and CSI-RS have different SCS-es,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for CBD measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

For FR2, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

# 8.5.6 Requirements for CSI-RS based candidate beam detection

# 8.5.6.1 Introduction

The requirements in this section apply for each CSI-RS resource in the set  $\bar{q}_1$  configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.6.2.

## 8.5.6.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set  $\bar{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_LR}}$  within  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period provided CSI-RS  $\hat{\text{Es/Iot}}$  is according to Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in table 8.5.6.2-1 and 8.5.6.2-2 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq 320$ ms.

The value of T<sub>Evaluate CBD CSI-RS</sub> is defined in Table 8.5.6.2-1 for FR1.

The value of T<sub>Evaluate CBD CSI-RS</sub> is defined in Table 8.5.6.2-2 for FR2 with N=8.

### For FR1.

- $P=1/(1-T_{CSI-RS}/MGRP)$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

### For FR2,

- P=1, when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1-T_{CSI-RS}/MGRP)$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- P=1/(1 T<sub>CSI-RS</sub> /T<sub>SMTCperiod</sub>), when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T<sub>CSI-RS</sub> < T<sub>SMTCperiod</sub>).
- P is 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ).
- P is  $1/(1-T_{CSI-RS}/MGRP-T_{CSI-RS}/T_{SMTCperiod})$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (TCSI-RS <  $T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{CSI-RS}/MGRP)*3$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- P is  $1/\{1-T_{CSI-RS}/min(T_{SMTCperiod},MGRP)\}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T<sub>CSI-RS</sub> /MGRP)\* 3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion (T<sub>CSI-RS</sub> = T<sub>SMTCperiod</sub>) and SMTC occasion is partially overlapped with measurement gap (T<sub>SMTCperiod</sub> < MGRP) [Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM/BFD/BM-RS, or other CBD-RS, according to the measurement restrictions defined in section TBD.]</li>

The values of M<sub>CBD</sub> used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

-  $M_{CBD} = 3$ , if the CSI-RS resource configured in the set  $\bar{q}_1$  is transmitted with Density = 3.

Table 8.5.6.2-1: Evaluation period T<sub>Evaluate\_CBD\_CSI-RS</sub> for FR1

Conf	iguration	TEvaluate_CBD_CSI-RS (ms)	
non-DR	X, DRX cycle	max([25], ceil(M <sub>CBD</sub> *P) * T <sub>CSI-RS</sub> )	
≤ 320ms			
DRX cy	cle > 320ms	ceil(Mcbd *P) *Tdrx	
Note:	Note: $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\overline{q}_{\text{l}}$ . $T_{\text{DRX}}$ is the		
	DRX cycle ler	ngth.	

Table 8.5.6.2-2: Evaluation period T<sub>Evaluate\_CBD\_CSI-RS</sub> for FR2

Con	figuration	T <sub>Evaluate_CBD_CSI-RS</sub> (ms)		
non-DR	XX, DRX cycle	max([25], ceil(Mcbd *P*N) * Tcsi-rs)		
≤	320ms			
DRX c	ycle > 320ms	ceil(Mcbd *P*N) *Tdrx		
Note:	T <sub>CSI-RS</sub> is the	he periodicity of CSI-RS resource in the set $\;\overline{q}_{\!\scriptscriptstyle 1}.\;$ $T_{\sf DRX}$ is the		
	DRX cycle ler	ngth.		

### 8.5.6.3 Measurement restriction for CSI-RS based candidate beam detection

For both FR1 and FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for CBD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for CBD measurement, the UE shall be able to perform CSI-RS based CBD measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for CBD measurement, the UE shall be able to perform CSI-RS based CBD measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS based CBD measurement for without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer measurement period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for CBD measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for CBD measurement without any restriction.

For FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE is required to measure one of but not both CSI-RS for CBD measurement and the other CSI-RS. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

# 8.5.7 Scheduling availability of UE during beam failure detection

Scheduling availability restrictions when the UE is performing beam failure detection are described in the following clauses.

# 8.5.7.1 Scheduling availability of UE performing beam failure detection with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured as BFD-RS with the same SCS as PDSCH/PDCCH in FR1.

# 8.5.7.2 Scheduling availability of UE performing beam failure detection with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to beam failure detection based on SSB as BFD-RS. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to beam failure detection based on SSB configured as BFD-RS.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on SSB symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on FR1 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which PCell or PSCell is configured.

# 8.5.7.3 Scheduling availability of UE performing beam failure detection on FR2

The following scheduling restriction applies due to beam failure detection.

- For the case where no RSs are provided for BFD, or where CSI-RS as BFD-RS is explicitly configured and is type-D QCLed with active TCI state for PDCCH/PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON
  - There are no scheduling restrictions due to beam failure detection performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

# 8.5.7.4 Scheduling availability of UE performing beam failure detection on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR DC

There are no scheduling restrictions on FR1 serving cell(s) due to beam failure detection performed on FR2 serving PCell and/or PSCell.

There are no scheduling restrictions on FR2 serving cell(s) due to beam failure detection performed on FR1 serving PCell and/or PSCell.

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

# 8.5.8 Scheduling availability of UE during candidate beam detection

Scheduling availability restrictions when the UE is performing L1-RSRP measurement for candidate beam detection are described in the following clauses.

# 8.5.8.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH/PDCCH in FR1.

# 8.5.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on one serving cell applies to all other serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When

inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands.

# 8.5.8.3 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to candidate beam detection

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

When intra-band carrier aggregation in FR2 is configured, the scheduling restrictions on to one serving cell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

# 8.5.8.4 Scheduling availability of UE performing L1-RSRP measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR-DC

There are no scheduling restrictions on FR1 serving cell(s) due to L1-RSRP measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on FR1 serving cell(s).

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

# 8.6 Active BWP switch delay

## 8.6.1 Introduction

The requirements in this section apply for a UE configured with more than one BWP on PCell or any activated SCell in standalone NR or NE-DC, PCell, PSCell or any activated SCell in MCG or SCG in NR-DC, or PSCell or any activated SCell in SCG in EN-DC. UE shall complete the switch of active DL and/or UL BWP within the delay defined in this section.

# 8.6.2 DCI and timer based BWP switch delay

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after the beginning of DL slot  $n+T_{BWPswitchDelay}$ .

The UE is not required to transmit UL signals or receive DL signals during time duration  $T_{BWPswitchDelay}$  on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this section when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where n is the beginning of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [2] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after the beginning of DL slot n+  $T_{BWPswitchDelay}$ .

The UE is not required to transmit UL signals or receive DL signals after *bwp-InactivityTimer* [2] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability bwp-SwitchingDelay [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

Table 8.6.2-1: BWP switch delay

μ	NR Slot	BWP switch delay TBWPswitchDelay (slots)	
μ	length (ms)	Type 1 <sup>Note 1</sup> Type 2 <sup>Note 1</sup>	
0	1	1	3
1	0.5	2	5
2	0.25	3	9
3	0.125	6	18

Note 1: Depends on UE capability.

If the BWP switch involves changing of SCS, the BWP Note 2: switch delay is determined by the larger one between the SCS before BWP switch and the SCS after BWP

#### 8.6.3 RRC based BWP switch delay

For RRC-based BWP switch, after the UE receives BWP switching request, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after the beginning of DL slot n +  $\frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}$ , where

NR Slot length

DL slot n is the last slot containing the RRC command, and

 $T_{RRCprocess\,ing\,De\,lay}$  is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331

 $T_{BWPswitchDelavRRC} = [6]ms$  is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by  $T_{RRCprocessingDelay}$  +  $T_{BWPswitchDelayRRC}$  on the cell where RRC-based BWP switch occurs.

#### 8.7 Void

#### NE-DC: E-UTRAN PSCell Addition and Release Delay 88

#### 8.8.1 Introduction

This section defines requirements for the delay within which the UE shall be able to configure an E-UTRAN PSCell in NR - E-UTRA dual connectivity. The requirements are applicable to an NR - E-UTRA dual connectivity capable UE.

#### 8.8.2 E-UTRAN PSCell Addition Delay Requirement

The requirements in this section shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving E-UTRAN PSCell addition in subframe n, the UE shall be capable to transmit PRACH preamble towards E-UTRAN PSCell no later than in subframe *n*+ T<sub>config\_EUTRAN-PSCell</sub>:

### Where:

 $T_{config\_EUTRAN-PSCell} = 20ms + T_{activation\_time} + 50ms + T_{PCell\_DU} + T_{E-UTRAN-PSCell\_DU}$ 

Tactivation time is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then Tactivation time is 20ms. If the E-UTRAN PSCell is unknown, then Tactivation\_time is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

T<sub>PCell</sub> D<sub>U</sub> is the delay uncertainty due to PCell PRACH preamble transmission. T<sub>PCell</sub> D<sub>U</sub> is up to 20ms if E-UTRAN PSCell activation is interrupted by a PCell PRACH preamble transmission, otherwise it is 0.

 $T_{\text{E-UTRAN-PSCell\_DU}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell.  $T_{\text{E-UTRAN-PSCell\_DU}}$  is up to 30ms.

E-UTRAN PSCell is known if it has been meeting the following conditions:

During the last [5] seconds before the reception of the E-UTRAN PSCell configuration command:

- the UE has sent a valid measurement report for the E-UTRAN PSCell being configured and
- the E-UTRAN PSCell being configured remains detectable according to the cell identification conditions specified in clause 8.8 of TS 36.133 [15],
- E-UTRAN PSCell being configured also remains detectable during the E-UTRAN PSCell configuration delay according to the cell identification conditions specified in clause 8.8 of TS 36.133 [15].

otherwise it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

# 8.8.3 E-UTRAN PSCell Release Delay Requirement

The requirements in this section shall apply for a UE which is configured with PCell and E-UTRAN PSCell, and may also be configured with one or more SCells and/or E-UTRAN SCells.

Upon receiving E-UTRAN PSCell release in subframe n, the UE shall accomplish the release actions specified in TS 38.331 [2] no later than in subframe n+20.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

# 8.9 NR-DC: PSCell Addition and Release Delay

## 8.9.1 Introduction

This section defines requirements for the delay within which the UE shall be able to configure an PSCell in NR dual connectivity. The requirements are applicable to an NR dual connectivity capable UE.

# 8.9.2 PSCell Addition Delay Requirement

The requirements in this section shall apply for the UE configured with only PCell.

Upon receiving PSCell addition in subframe n, the UE shall be capable to transmit PRACH preamble towards PSCell no later than in subframe  $n + T_{\text{config PSCell}}$ :

Where:

$$T_{config\_PSCell} = T_{RRC\_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell\_DU} + 2 \ ms$$

T<sub>RRC\_delay</sub> is the RRC procedure delay as specified in TS 38.331 [2].

 $T_{processing}$  is the SW processing time needed by UE, including RF warm up period.  $T_{processing} = 20$  ms if PSCell is in FR1,  $T_{processing} = 40$  ms if PSCell is in FR2.

T<sub>search</sub> is the time for AGC settling and PSS/SSS detection.

For NR PSCell in FR1: if the target cell is known, then  $T_{search} = 0$  ms. If the target cell is an unknown cell and signal quality is sufficient for successful cell detection on the first attempt, then  $T_{search} = 3*$  Trs ms;

For PSCell in FR2: if the target cell is a known inter-frequency cell,  $T_{search} = 0$  ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot  $\geq$  [-2]dB, then  $T_{search} = 24*$  Trs ms.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta}$  = 1\*Trs ms.

 $T_{PSCell\_DU}$  is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell.  $T_{PSCell\_DU}$  is up to x\*10 + 10 ms. x is defined in the table 6.3.3.2-2 of TS 36.133 [6].

Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs = [5] ms assuming the SSB transmission periodicity is [5] ms. There is no requirements if the SSB transmission periodicity is not 5 ms.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

# 8.9.3 PSCell Release Delay Requirement

The requirements in this section shall apply for a UE which is configured with PCell and one PSCell.

Upon receiving PSCell release in subframe n, the UE shall accomplish the release actions specified in TS 38.331 [2] no later than in subframe  $n+T_{RRC\_delay}$ :

Where

T<sub>RRC delay</sub> is the RRC procedure delay as specified in TS 38.331 [2].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

# 8.10 Active TCI state switching delay

## 8.10.1 Introduction

The requirements in this section apply for a UE configured with one or more TCI state configurations on serving cell in MR-DC or standalone NR. UE shall complete the switch of active TCI state within the delay defined in this section.

## 8.10.2 Known conditions for TCI state

The TCI state is known if it has been meeting the following conditions:

- TCI state switch is within [X] ms of last transmission of the resource for beam reporting/ measurement for the target TCI state
- The UE has sent at least 1 measurement report for the target TCI state
- The TCI state shall remain detectable during the TCI state switching period
  - SNR of the TCI state is > -3dB

Otherwise, the TCI state is unknown.

# 8.10.3 MAC-CE based TCI state switch delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command at slot n, UE shall be able to receive PDCCH on the new beam of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{HARQ}$  +3 ms + $TO_k*(T_{first-SSB} + T_{SSB-proc})$ . The UE shall be able to receive on the old TCI state until slot n+  $T_{HARQ}$  +3 ms + $TO_k*(T_{first-SSB})$ .

Where T<sub>HARO</sub> is the timing between DL data transmission and acknowledgement as specified in TS 38.321 [7];

T<sub>first-SSB</sub> is time to first SSB transmission after TCI state command is received by the UE;

 $T_{SSB-proc} = 2 \text{ ms};$ 

 $TO_k = 1$  if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command at slot n, UE shall be able to receive PDCCH on the new beam of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{HARQ}$  +3 ms +  $T_{L1-RSRP}$  + $T_{Ouk}$ \*( $T_{first-SSB}$ +  $T_{SSB-proc}$ ). The UE shall be able to receive on the old TCI state until slot n+  $T_{HARQ}$  +3 ms+  $T_{L1-RSRP}$  + $T_{Ok}$ \*( $T_{first-SSB}$ ).

Where T<sub>L1-RSRP</sub> is the time for L1-RSRP measurement for Rx beam refinement, defined as

- T<sub>BM\_Measurement\_Period\_SSB</sub> for SSB in FR2 as specified in clause 9.5.4.1, with the assumption of M=1
- T<sub>BM\_Measurement\_Period\_CSI-RS</sub> for CSI-RS in FR2 as specified in clause 9.5.4.2
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to MaxNumberRxBeam

T<sub>first-SSB</sub> is time to first SSB transmission after MAC CE command is decoded by the UE;

TO<sub>uk</sub> = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement

If the target TCI state is not measured and reported by the UE prior to TCI state switching, upon receiving PDSCH carrying MAC-CE activation command at slot n, UE shall be able to receive PDCCH on the new beam of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{HARQ}$  +3 ms +  $T_{L1\text{-RSRP}}$  +  $T_{Ouk}$ \* ( $T_{first\text{-SSB}}$  +  $T_{SSB\text{-proc}}$ ). The UE shall be able to receive on the old TCI state until slot n+  $T_{HARQ}$  +3 ms+  $T_{L1\text{-RSRP}}$  + $TO_k$ \*( $T_{first\text{-SSB}}$ ).

During MAC CE based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

# 8.10.4 DCI based TCI switch delay

If the target TCI state is known, when a UE is configured with the higher layer parameter *tci-PresentInDCI* which is set as 'enabled' for the CORESET scheduling the PDSCH at slot n, UE shall be able to receive PDSCH or transmit PUSCH on the new beam of the serving cell on which TCI state switch occurs no later than at slot n+*timeDurationForQCL*, where, *timeDurationForQCL* is the time required by the UE to perform PDCCH reception and applying spatial QCL information received in DCI for PDSCH processing as described in TS 38.214 [26], the value of *timeDurationForQCL* is defined in TS 38.306 [14].

The known condition for TCI state defined in clause 8.10.2 is applied.

During DCI based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

# 8.10.5 RRC based TCI state delay

If the target TCI state is known, upon receiving PDSCH carrying RRC activation command at slot n, UE shall be able to receive PDCCH on the new beam of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{RRC\_processing} + TO_k*(T_{first-SSB} + T_{SSB-proc})$ . Where  $T_{RRC\_processing}$  is the RRC processing delay,  $T_{first-SSB}$ ,  $T_{SSB-proc}$  and  $TO_k$  are as defined in clause 8.10.3. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

If the target TCI state is unknown, upon receiving PDSCH carrying RRC activation command at slot n, UE shall be able to receive PDCCH on the new beam of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{RRC\_processing}$  + $T_{L1-RSRP}$ + $T_{Ouk}$ \*( $T_{first-SSB}$ + $T_{SSB-proc}$ ). Where  $T_{RRC\_processing}$  is the RRC processing delay,  $T_{first-SSB}$  and  $T_{Ouk}$  are as defined in clause 8.10.3. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

During RRC based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

# 8.10.6 Active TCI state list update delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new TCI state no later than slot  $n+T_{HARQ}+3ms+TO_k*(T_{first-SSB}+T_{SSB-proc})$ . Where  $T_{HARQ}$ ,  $T_{first-SSB}$ ,  $T_{SSB-proc}$  and  $TO_k$  are as defined in clause 8.10.3.

# 9 Measurement Procedure

# 9.1 General measurement requirement

## 9.1.1 Introduction

This clause contains general requirements on the UE regarding measurement reporting in RRC\_CONNECTED state. The requirements are split in intra-frequency, inter-frequency, inter-RAT E-UTRAN FDD, inter-RAT E-UTRAN TDD, and L1-RSRP measurements requirements. These measurements may be used by the NG-RAN. The measurement quantities are defined in TS38.215[4], the measurement model is defined in TS38.300[10], TS37.340[17] and measurement accuracies are specified in clause 10. Control of measurement reporting is specified in TS 36.331 [16].

In the requirements of clause 9, the exceptions for side conditions apply as follows:

- for the UE capable of CA but not configured with any SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1 for UE supporting CA in FR1, and clause B.3.2.3 for UE supporting CA in FR2, respectively;
- for the UE capable of CA and configured with at least one SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.2 for UE configured with CA in FR1, and clause B.3.2.4 for UE supporting CA in FR2 respectively;
- for the UE capable of SUL but not configured with SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1;
- for the UE capable of SUL and configured with at least one SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.2 for UE configured with SUL in FR1.

# 9.1.2 Measurement gap

If the UE requires measurement gaps to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE does not support independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in [18, 19, 20], in order for the requirements in the following subsections to apply the network must provide a single per-UE measurement gap pattern for concurrent monitoring of all frequency layers.

If the UE requires measurement gaps to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in [18, 19, 20], in order for the requirements in the following subsections to apply the network must provide either per-FR measurement gap patterns for frequency range where UE requires per-FR measurement gap for concurrent monitoring of all frequency layers of each frequency range independently, or a single per-UE measurement gap pattern for concurrent monitoring of all frequency layers of all frequency ranges.

During the per-UE measurement gaps the UE:

- is not required to conduct reception/transmission from/to the corresponding E-UTRAN PCell, E-UTRAN SCell(s) and NR serving cells for E-UTRA-NR dual connectivity except the reception of signals used for RRM measurement
- is not required to conduct reception/transimssion from/to the corresponding NR serving cells for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement
- is not required to conduct reception/transmission from/to the corresponding PCell, SCell(s) and E-UTRAN serving cells for NR-E-UTRA dual connectivity except the reception of signals used for RRM measurement
- is not required to conduct reception/transimssion from/to the corresponding NR serving cells for NR-DC except the reception of signals used for RRM measurement

During the per-FR measurement gaps the UE:

- is not required to conduct reception/transmission from/to the corresponding E-UTRAN PCell, E-UTRAN SCell(s) and NR serving cells in the corresponding frequency range for E-UTRA-NR dual connectivity except the reception of signals used for RRM measurement
- is not required to conduct reception/transmission from/to the corresponding NR serving cells in the corresponding frequency range for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement
- is not required to conduct reception/transmission from/to the corresponding PCell, SCell(s) and E-UTRAN serving cells in the corresponding frequency range for NR-E-UTRA dual connectivity except the reception of signals used for RRM measurement
- is not required to conduct reception/transmission from/to the corresponding NR serving cells in the corresponding frequency range for NR-DC except the reception of signals used for RRM measurement

UEs shall support the measurement gap patterns listed in Table 9.1.2-1 based on the applicability specified in table 9.1.2-2 and 9.1.2-3. UE determines measurement gap timing based on gap offset configuration and measurement gap timing advance configuration provided by higher layer signalling as specified in TS 38.331 [2] and [16].

Table 9.1.2-1: Gap Pattern Configurations

Gap Pattern Id	Measurement Gap Length (MGL, ms)	Measurement Gap Repetition Period (MGRP, ms)
0	6	40
1	6	80
2	3	40
3	3	80
4	6	20
5	6	160
6 7	4	20
7	4	40
8	4	80
9	4	160
10	3	20
11	3	160
12	5.5	20
13	5.5	40
14	5.5	80
15	5.5	160
16	3.5	20
17	3.5	40
18	3.5	80
19	3.5	160
20	1.5	20
21	1.5	40
22	1.5	80
23	1.5	160

Table 9.1.2-2: Applicability for Gap Pattern Configurations supported by the E-UTRA-NR dual connectivity UE or NR-E-UTRA dual connectivity UE

Measurement gap pattern configuration	Serving cell	Measurement Purpose	Applicable Gap Pattern Id
	E-UTRA + FR1, or	non-NR RAT Note1,2	0,1,2,3
Per-UE	E-UTRA + FR2, or	FR1 and/or FR2	0-11
measurement	E-UTRA + FR1 +	non-NR RAT <sup>Note1,2</sup>	0, 1, 2, 3, 4, 6, 7, 8,10
gap	FR2	and FR1 and/or	
		FR2	
Per FR	E-UTRA and, FR1 if	non-NR RAT Note1,2	0,1,2,3
measurement	configured		
gap	FR2 if configured		No gap

E-UTRA and, FR1 if configured	FR1 only	0-11
FR2 if configured		No gap
E-UTRA and, FR1 if configured	FR2 only	No gap
FR2 if configured		12-23
E-UTRA and, FR1 if configured	non-NR RAT Note1,2 and FR1	0, 1, 2, 3, 4, 6, 7, 8,10
FR2 if configured		No gap
E-UTRA and, FR1 if configured	FR1 and FR2	0-11
FR2 if configured		12-23
E-UTRA and, FR1 if configured	non-NR RAT Note1,2 and FR2	0, 1, 2, 3, 4, 6, 7, 8,10
FR2 if configured		12-23
E-UTRA and, FR1 if configured	non-NR RAT Note1,2 and FR1 and FR2	0, 1, 2, 3, 4, 6, 7, 8,10
FR2 if configured		12-23

Note: In E-UTRA-NR dual connectivity mode, if GSM or UTRA TDD or UTRA FDD inter-RAT frequency layer is configured to be monitered, only measurement gap pattern #0 and #1 can be used for per-FR gap in E-UTRA and FR1 if configured, or for per-UE gap.

- NOTE 1: In E-UTRA-NR dual connectivity mode, non-NR RAT includes E-UTRA, UTRA and/or GSM. In NR-E-UTRA dual connectivity mode, non-NR RAT means E-UTRA.
- NOTE 2: In E-UTRA-NR dual connectivity mode, the gap patterns with short MGL (gap pattern #2, 3, 6, 7, 8, 10) are supported by UEs which support shortMeasurementGap-r14. In NR-E-UTRA dual connectivity mode, the measurement gap pattern #2, 3, 6, 7, 8, 10 are supported by the UEs which indicate the capability signalling of supportedGapPattern to network.
- NOTE 3: When E-UTRA inter-frequency RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern #0 can be used.

### In E-UTRA-NR dual connectivity mode,

- if per-UE measurement gap is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap starts at time T<sub>MG</sub> ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measuremet gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measuremet gap for FR2 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR2 starts at time T<sub>MG</sub> ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among SCG serving cells subframes in FR2.

### In NR-E-UTRA dual connectivity mode,

- if per-UE measurement gap is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap starts at time  $T_{MG}$  ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms and UE has NR serving cell in FR1, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes in FR1.
- if per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms and UE doesn't have NR serving cell in FR1, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among SCG serving cells subframes.
- if per-FR measuremet gap for FR2 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR2 starts at time  $T_{MG}$  ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes in FR2.

In NR-NR dual connectivity mode,

- If per-UE measurement gap is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap starts at time  $T_{MG}$  ms advanced to the end of the latest MCG subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- If per-FR measuremet gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest MCG subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- If per-FR measurenet gap for FR2 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR2 starts at time T<sub>MG</sub> ms advanced to the end of the latest SCG subframe occurring immediately before the configured measurement gap among SCG serving cells subframes in FR2.

T<sub>MG</sub> is the MG timing advance value provided in mgta according to [2].

In determining the measurement gap starting point, UE shall use the DL timing of the latest E-UTRA or NR subframe occurring immediately before the configured measurement gap among E-UTRA or NR serving cells.

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

For per-FR measurement gap capable UE configured with E-UTRA-NR dual connectivity or NR-E-UTRA dual connectivity, when serving cells are in E-UTRA and FR1, measurement objects are in both E-UTRA /FR1 and FR2,

- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN;
- If MN indicates UE that the measurement gap from MN applies to only LTE/FR1 serving cell(s),
  - UE fulfils the measurement requirements for FR1/LTE measurement objects based on the configured measurement gap pattern;
  - UE fulfils the requirements for FR2 measurement objects based on effective MGRP=20ms;

For per-FR measurement gap capable configured with E-UTRA-NR dual connectivity, NR-E-UTRA dual connectivity or NR-NR dual connectivity, when serving cells are in E-UTRA, FR1 and FR2, or in E-UTRA and FR2, or in FR1 and FR2, measurement objects are in both E-UTRA /FR1 and FR2,

- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN.

Table 9.1.2-3: Applicability for Gap Pattern Configurations supported by the UE with NR standalone operation (with single carrier, NR CA and NR-DC configuration)

Measurement gap pattern configuration	Serving cell	Measurement Purpose NOTE 2	Applicable Gap Pattern Id
		E-UTRA only <sup>NOTE3</sup>	0,1,2,3
	FR1 NOTE5, or	FR1 and/or FR2	0-11
	FR1 + FR2	E-UTRAN and	0, 1, 2, 3, 4, 6, 7, 8,10
5 115		FR1 and/or FR2	
Per-UE		E-UTRA only NOTE3	0,1,2,3
measurement		FR1 only	0-11
gap		FR1 and FR2	0-11
	FR2 NOTE5	E-UTRAN and FR1 and/or FR2 NOTE3	0, 1, 2, 3, 4, 6, 7, 8,10
		FR2 only	12-23
Per FR	FR1 if configured	E-UTRA only NOTE3	0,1,2,3
measurement	FR2 if configured		No gap
gap	FR1 if configured	FR1 only	0-11

FR2 if configured		No gap
FR1 if configured	FR2 only	No gap
FR2 if configured		12-23
FR1 if configured	E-UTRA and FR1	0, 1, 2, 3, 4, 6, 7, 8,10
FR2 if configured	NOTE3	No gap
FR1 if configured	FR1 and FR2	0-11
FR2 if configured		12-23
FR1 if configured	E-UTRA and FR2	0, 1, 2, 3, 4, 6, 7, 8,10
FR2 if configured	NOTE3	12-23
FR1 if configured	E-UTRA and FR1	0, 1, 2, 3, 4, 6, 7, 8,10
FR2 if configured	and FR2 NOTE3	12-23

- NOTE 1: When E-UTRA inter-RAT RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern #0 can be used.
- NOTE 2: Measurement purpose which includes E-UTRA measurements includes also inter-RAT E-UTRA RSRP and RSRQ measurements for E-CID
- NOTE 3: The measurement gap pattern #2, 3, 6, 7, 8, 10 are supported by the UEs which indicate the capability signalling of supportedGapPattern to network.

NOTE4: If per-UE measurement gap is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap starts at time T<sub>MG</sub> ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among all serving cells subframes. If per-FR measuremet gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among serving cells subframes in FR1.

If per-FR measurenet gap for FR2 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR2 starts at time  $T_{MG}$  ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among serving cells subframes in FR2.

 $T_{\text{MG}}$  is the MG timing advance value provided in *mgta* according to [2]. In determining the measurement gap starting point, UE shall use the DL timing of the latest subframe occurring immediately before the configured measurement gap among serving cells.

NOTE 5: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), for per-FR gap based measurement, when there is no serving cell in a particular FR, where measurements objects are configured, regardless if explicit per-FR measurement gap is configured in this FR, the effective MGRP in this FR used to determine requirements;

- 20 ms for FR2 NR measurements
- 40 ms for FR1 NR measurements
- 40 ms for LTE measurements
- 40 ms for FR1+LTE measurements

For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), when serving cells are in FR1 or FR2, measurement objects are in both E-UTRA /FR1 and FR2,

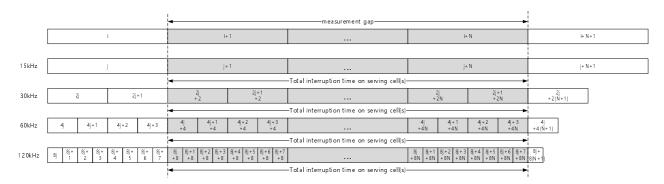
- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN;

If measurement gap is configured in one FR but measurement object is not configured in the FR, the scheduling opportunity in the FR depends on the configured measurement gap pattern.

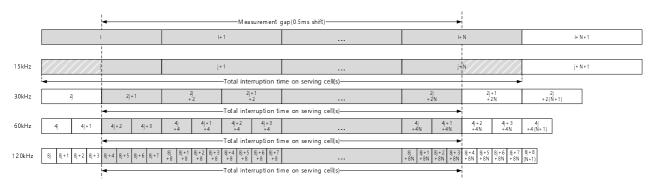
For E-UTRA-NR dual connectivity, if UE is not capable of per-FR-gap, total interruption time on SCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms. And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells in SCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms, and total interruption time on FR2 serving cells in SCG during MGL is defined only when MGL(N) = 5.5ms, 3.5ms and 1.5ms, given that the reference time for per-FR gap in FR2 is based on an FR2 serving cell.

For NR standalone operation (with single carrier, NR CA and NR-DC configuration), if UE is not capable of per-FR-gap, total interruption time on a serving cell during MGL is defined when MGL(N) = 6ms, 5.5ms, 4ms, 3.5ms, 3ms, and 1.5ms. And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms, and total interruption time on FR2 serving cells during MGL is defined only when MGL(N) = 5.5ms, 3.5ms and 1.5ms, given that the reference time for per-FR gap in FR2 is based on an FR2 serving cell.

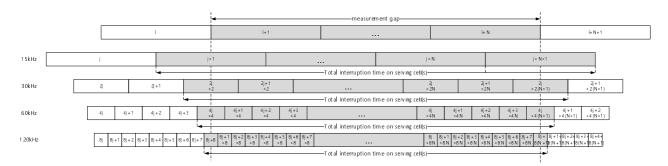
For NR-E-UTRA dual connectivity, if UE is not capable of per-FR-gap, total interruption time on MCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms. And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells in MCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms, and total interruption time on FR2 serving cells in MCG during MGL is defined only when MGL(N) = 5.5ms, 3.5ms and 1.5ms, given that the reference time for per-FR gap in FR2 is based on an FR2 serving cell.



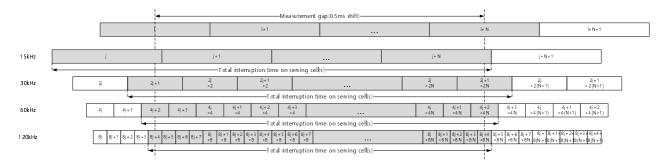
(a) Measurement gap with MGL = N(ms) with MG timing advance of 0ms for synchronous EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and synchronous NE-DC



(b) Measurement gap with MGL = N(ms) with MG timing advance of 0.5ms for synchronous EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and synchronous NE-DC



(c) Measurement gap with MGL = N(ms) with MG timing advance of 0ms for asynchronous EN-DC and asynchronous NE-DC



(d) Measurement gap with MGL = N(ms) with MG timing advance of 0.5ms for asynchronous EN-DC and asynchronous NE-DC

Figure 9.1.2-1: Measurement GAP and total interruption time on serving cells for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC

The corresponding total number of interrupted slots on serving cells is listed in Table 9.1.2-4 and Table 9.1.2-4a for synchronous EN-DC, NR standalone and synchronous NE-DC, and asynchronous EN-DC and asynchronous NE-DC respectively.

Table 9.1.2-4: Total number of interrupted slots on serving cells during MGL for Synchronous EN-DC ,NR standalone operation (with single carrier, NR CA and NR-DC configuration) and Synchronous NE-DC with per-UE measurement gap or per-FR measurement gap for FR1

NR	Total number of interrupted slots on serving cells					
SCS (kHz)	When MG timing advance of 0ms is applied		When MG timing advance of 0.5r is applied		ce of 0.5ms	
	MGL=6ms	MGL=4ms	MGL=3ms	MGL=6ms	MGL=4ms	MGL=3ms
15	6	4	3	7 <sup>Note3</sup>	5 <sup>Note3</sup>	4 <sup>Note3</sup>
30	12	8	6	12	8	6
60	24	16	12	24	16	12
120	48	32	24	48	32	24
NOTE	NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on					

NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.

NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.

NOTE 3: Non-overlapped half-slots occur before and after the measurement gap. Whether a Rel-15 UE can receive and/or transmit in those half-slots is up to UE implementation.

Table 9.1.2-4a: Total number of interrupted slots on serving cells during MGL for Asynchronous EN-DC and Asynchronous NE-DC with per-UE measurement gap or per-FR measurement gap for FR1

NR	Total number of interrupted slots on serving cells					
SCS (kHz)	When MG timing advance of 0ms is applied			When MG t	iming advand is applied	ce of 0.5ms
(14.12)	MGL=6ms	MGL=4ms	MGL=3ms	MGL=6ms	MGL=4ms	MGL=3ms
15	7	5	4	7	5	4
30	13	9	7	13	9	7
60	25	17	13	25	17	13
120	49	33	25	49	33	25

NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.

NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.

In case that UE capable of per-FR measurement gap is configured with per-FR measurement gap for FR2 serving cells, total number of interrupted slots on FR2 serving cells during MGL is listed in Table 9.1.2-4b.

Table 9.1.2-4b: Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR2

NR		Total number of interrupted slots on FR2 serving cells				
SCS (kHz)	When MG timing advance of 0ms is applied			When MG timing advance of 0.25ms is applied		
	MGL=5.5ms	MGL=3.5ms	MGL=1.5ms	MGL=5.5ms	MGL=3.5ms	MGL=1.5ms
60	22	14	6	22	14	6
120	44	28	12	44	28	12

It is up to UE implementation whether or not the UE is able to conduct transmission in the following slot(s),

- when MGTA is not applied, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after measurement gap
- when MGTA is applied and the SCS of the UL carrier is other than 15kHz, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after measurement gap
- when MGTA is applied and the SCS of the UL carrier is 15kHz, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after the slot partially overlapped with measurement gap

where UL slot denotes that all the symbols in the slot are uplink symbols, and L=1 if  $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_{\text{c}}$  for the UL transmission is less than the length of one slot; L=2 otherwise.

Note: Network is supposed to take into account the possible difference between the estimated TA at network and actual TA at UE when scheduling UE in the above slot(s).

### Table 9.1.2-5: (Void)

### 9.1.2.1 EN-DC: Measurement Gap Sharing

For E-UTRA-NR dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers and inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on FR1 inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers, inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter *MeasGapSharingScheme* [2][16] and the value of X is defined as in Table 9.1.2.1-1, and

- $K_{intra} = 1 / X * 100$ ,
- $K_{inter} = 1 / (100 X) * 100$ ,

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.1.

Table 9.1.2.1-1: Value of parameter X for EN-DC measurement gap sharing

measGapSharingScheme	Value of X (%)
'00'	Equal splitting
'01'	25
'10'	50
<b>'11'</b>	75

## 9.1.2.1a SA: Measurement Gap Sharing

For NR standalone UE without NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, and/or inter-RAT E-UTRAN carriers.

For NR standalone UE without NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on FR1 inter-frequency carriers and/or inter-RAT E-UTRAN carriers.

For NR standalone UE without NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter *MeasGapSharingScheme* [2] and the value of X is defined as in Table 9.1.2.1a-1, and

- $K_{intra} = 1 / X * 100,$
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.2.

Table 9.1.2.1a-1: Value of parameter X for NR standalone measurement gap sharing

measGapSharingScheme	Value of X (%)
'00'	Equal splitting
'01'	25
'10'	50
'11'	75

### 9.1.2.1b NE-DC: Measurement Gap Sharing

For NR-E-UTRA dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers, and/or inter-RAT E-UTRA carriers.

For NR-E-UTRA dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers, and/or inter-RAT E-UTRA carriers.

For NR-E-UTRA dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when

SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter *measGapSharingConfig* [2][16] and the value of X is defined as in Table 9.1.2.1b-1, and

- $K_{intra} = 1 / X * 100,$
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.x.

Table 9.1.2.1b-1: Value of parameter X for NE-DC measurement gap sharing

measGapSharingScheme	Value of X (%)
'00'	Equal splitting
'01'	25
'10'	50
'11'	75

## 9.1.2.1c NR-DC: Measurement Gap Sharing

For UE with NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, and/or inter-RAT E-UTRAN carriers.

For UE with NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on FR1 inter-frequency carriers and/or inter-RAT E-UTRAN carriers.

For UE with NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter *measGapSharingConfig* [2] and the value of X is defined as in Table 9.1.2.1c-1, and

- $K_{intra} = 1 / X * 100$ .
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.x.

Table 9.1.2.1c-1: Value of parameter X for NR-DC measurement gap sharing

measGapSharingConfig	Value of X (%)
'00'	Equal splitting
'01'	25
'10'	50
'11'	75

# 9.1.3 UE Measurement capability

# 9.1.3.1 EN-DC: Monitoring of multiple layers using gaps

The requirements in this section are applicable for UE capable of and configured with the EN-DC operation mode.

When monitoring of multiple inter-frequency E-UTRAN, inter-RAT NR, GSM, UTRA FDD and UTRA TDD carriers as configured by E-UTRA PCell, and inter-frequency NR carriers as configured by PSCell using gaps (or without using gaps provided the UE supports such capability) is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, SFTD, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, UTRAN TDD P-CCPCH RSCP, UTRAN FDD CPICH measurements, GSM carrier RSSI, etc.) of detected cells on all the layers.

For UE configured with the EN-DC operation, the effective total number of frequencies excluding the frequencies of the PSCell, SCells, E-UTRA PCell, and E-UTRA SCells being monitored is N<sub>freq, EN-DC</sub>, which is defined as:

 $N_{\text{freq, EN-DC}} = N_{\text{freq, EN-DC, NR}} + N_{\text{freq, EN-DC, E-UTRA}} + N_{\text{freq, EN-DC, UTRA}} + M_{\text{EN-DC, GSM}}$ 

where

N<sub>freq, EN-DC, E-UTRA</sub> is the number of E-UTRA inter-frequency carriers being monitored (FDD and TDD) as configured by E-UTRA PCell or via LPP [22],

 $N_{\text{freq, EN-DC, NR}} \leq N_{\text{freq, EN-DC, NR, inter-RAT}} + N_{\text{freq, EN-DC, NR, inter-freq}}$ 

where

 $N_{\text{freq, EN-DC, NR, inter-RAT}}$  is the number of NR inter-RAT carriers excluding NR serving carrier(s) being monitored as configured by E-UTRA PCell [15],

 $N_{\text{freq, EN-DC, NR, inter-freq}}$  is the number of NR inter-frequency carriers being monitored as configured by PSCell,

 $N_{\text{freq, EN-DC, UTRA}}$  is the number of UTRA inter-RAT carriers being monitored as configured by E-UTRA PCell (FDD and TDD).

 $M_{EN-DC, GSM}$  is an integer which is a function of the number of GSM inter-RAT carriers as configured by E-UTRA PCell on which measurements are being performed.  $M_{EN-DC, GSM}$  is equal to 0 if no GSM carrier is being monitored. For a MGRP of 40 ms,  $M_{EN-DC, GSM}$  is equal to 1 if cells on up to 32 GSM carriers are being measured. For a MGRP of 80 ms,  $M_{EN-DC, GSM}$  is equal to ceil( $N_{carriers,GSM}$ /20) where  $N_{carriers,GSM}$  is the number of GSM carriers on which cells are being measured.

## 9.1.3.1a SA: Monitoring of multiple layers using gaps

The requirements in this section are applicable for UE configured with SA NR operation mode.

When monitoring of multiple inter-RAT E-UTRAN carriers and inter-frequency NR carriers using gaps (or without using gaps provided the UE supports such capability) is configured by PCell, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRA

For UE configured with the NR SA operation, the effective total number of frequencies, excluding the frequencies of the PCell, PSCell and SCells being monitored, is  $N_{\text{freq, SA}}$ , which is defined as:

 $N_{\text{freq, SA}} = N_{\text{freq, SA, NR}} + N_{\text{freq, SA, E-UTRA}},$ 

where

 $N_{\text{freq, SA, E-UTRA}}$  is the number of E-UTRA inter-RAT carriers being monitored (FDD and TDD) as configured by PCell or via LPP [22],

 $N_{\text{freq, SA, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell.

# 9.1.3.1b NE-DC: Monitoring of multiple layers using gaps

The requirements in this section are applicable for UE capable of and configured with the NE-DC operation mode.

When monitoring of multiple inter-frequency E-UTRAN carriers as configured by E-UTRA PSCell, inter-RAT E-UTRAN carriers as configured by PCell, and inter-frequency NR carriers as configured by PCell using gaps (or without using gaps provided the UE supports such capability) is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, SFTD, E-UTRAN RSRP, E-UTRAN RSRQ, and E-UTRAN RS-SINR measurements, etc.) of detected cells on all the layers.

For UE configured with the NE-DC operation, the effective total number of frequencies excluding the frequencies of the PCell, SCells, E-UTRA PSCell, and E-UTRA SCells being monitored is N<sub>freq, NE-DC</sub>, which is defined as:

 $N_{\text{freq, NE-DC}} = N_{\text{freq, NE-DC, NR}} + N_{\text{freq, NE-DC, E-UTRA}}$ 

where

N<sub>freq, NE-DC, NR</sub> is the number of NR inter-frequency carriers being monitored as configured by PCell,

 $N_{\text{freq, NE-DC, E-UTRA}} \leq N_{\text{freq, NE-DC, E-UTRA, inter-RAT}} + N_{\text{freq, NE-DC, E-UTRA, inter-freq}}$ 

where

N<sub>freq, NE-DC, E-UTRA, inter-RAT</sub> is the number of E-UTRA inter-RAT carriers (FDD and TDD) excluding E-UTRA serving carrier(s) being monitored as configured by PCell or via LPP [22],

 $N_{\text{freq, NE-DC, E-UTRA, inter-freq}}$  is the number of E-UTRA inter-frequency carriers (FDD and TDD) being monitored as configured by E-UTRA PSCell [15] or via LPP [22].

# 9.1.3.1c NR-DC: Monitoring of multiple layers using gaps

The requirements in this section are applicable for UE configured with NR-DC operation mode.

When monitoring of multiple inter-RAT E-UTRAN carriers and inter-frequency NR carriers using gaps (or without using gaps provided the UE supports such capability) as configured by PCell, and inter-frequency NR carriers as configured by PSCell is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, etc.) of detected cells on all the layers.

For UE configured with the NR-DC operation, the effective total number of frequencies, excluding the frequencies of the PCell, PSCell and SCells being monitored, is  $N_{\text{freq, NR-DC}}$ , which is defined as:

 $N_{\text{freq, NR-DC}} = N_{\text{freq, NR-DC, NR}} + N_{\text{freq, NR-DC, E-UTRA}},$ 

where

 $N_{\text{freq, NR-DC, E-UTRA}}$  is the number of E-UTRA inter-RAT carriers being monitored (FDD and TDD) as configured by PCell or via LPP [22].

N<sub>freq, NR-DC, NR</sub> is the number of NR inter-frequency carriers being monitored as configured by PCell and PSCell.

## 9.1.3.2 EN-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with EN-DC operation, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PScell, and
- Depending on UE capability, 7 NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 3 FDD UTRA carriers, and

- Depending on UE capability, 3 TDD UTRA carriers, and
- Depending on UE capability, 32 GSM carriers (one GSM layer corresponds to 32 carriers), and
- Depending on UE capability, 1 E-UTRA FDD inter-frequency carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-frequency carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD, UTRA FDD, UTRA TDD and GSM (one GSM layer corresponds to 32 carriers) layers. The UE shall be capable of monitoring a total of at least 7 effective NR carrier frequency layers excluding NR serving carrier(s), comprising of any above defined combination of NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell and NR inter-frequency carriers configured by PSCell.

When the E-UTRA PCell and PSCell configure the same NR carrier frequency layer to be monitored by the UE in synchronous intra-band EN-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different deriveSSB-IndexFromCell indications or
- different SMTC configurations.

Note 1: The E-UTRA-NR dual connectivity capable UE configured with PSCell shall fulfil the requirements defined in only one of clause 9.1.3.2 and clause 8.1.2.1.1b.1 of TS 36.133 [15].

# 9.1.3.2a SA: Maximum allowed layers for multiple monitoring

If a UE is configured with SA NR operation mode, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-RAT carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-RAT carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least [13] effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD and E-UTRA TDD layers.

## 9.1.3.2b NE-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with NE-DC operation mode, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA TDD inter-RAT carriers excluding E-UTRA serving carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA FDD inter-RAT carriers excluding E-UTRA serving carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PSCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PSCell [15], and

- Depending on UE capability, 1 E-UTRA FDD inter-frequency carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-frequency carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, and E-UTRA TDD layers. The UE shall be capable of monitoring a total of at least 6 effective E-UTRA carrier frequency layers, excluding E-UTRA serving carrier(s), comprising of any above defined combination of E-UTRA inter-RAT carriers excluding E-UTRA serving carrier(s) configured by PCell and E-UTRA inter-frequency carriers configured by E-UTRA PSCell.

# 9.1.3.2c NR-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with NR-DC operation, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 7 NR inter-frequency carriers configured by PSCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-RAT carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-RAT carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least [13] effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD and E-UTRA TDD layers. The UE shall be capable of monitoring a total of at least [7] effective NR carrier frequency layers excluding NR serving carrier(s), which are configured by PCell and PSCell.

When PCell and PSCell configure the same NR carrier frequency layer to be monitored by the UE in NR-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different deriveSSB-IndexFromCell indications or
- different SMTC configurations.

# 9.1.4 Capabilities for Support of Event Triggering and Reporting Criteria

## 9.1.4.1 Introduction

This clause contains requirements on UE capabilities for support of event triggering and reporting criteria. As long as the measurement configuration does not exceed the requirements stated in clause 9.1.4.2, the UE shall meet all other performance requirements defined in clause 9 and clause 10.

The UE can be requested to make measurements under different measurement identities defined in TS 38.331 [2]. Each measurement identity corresponds to either event based reporting, periodic reporting, or no reporting. In case of event based reporting, each measurement identity is associated with an event triggering criterion. In case of periodic reporting, a measurement identity is associated with one periodic reporting criterion. In case of no reporting, a measurement identity is associated with one no reporting criterion.

The purpose of this clause is to set some limits on the number of different event triggering, periodic, and no reporting criteria the UE may be requested to track in parallel.

# 9.1.4.2 Requirements

In this section a reporting criterion corresponds to either one event (in the case of event based reporting), or one periodic reporting criterion (in case of periodic reporting), or one no reporting criterion (in case of no reporting). For event based reporting, each instance of event, with the same or different event identities, is counted as separate reporting criterion in Table 9.1.4.2-1.

The UE shall be able to support in parallel per category up to  $E_{cat}$  reporting criteria according to Table 9.1.4.2-1. For the measurement categories belonging to intra-frequency, inter-frequency, and inter-RAT measurements (i.e. without counting other categories that the UE shall always support in parallel), the UE need not support more than the total number of reporting criteria as follows:

- For UE configured with EN-DC:  $E_{cat.EN-DC.NR} + E_{cat.EN-DC.E-UTRA}$ , where

 $E_{cat,EN-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria applicable for UE configured with EN-DC according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PSCell and SCells carrier frequencies,

 $E_{cat,EN-DC,E-UTRA}$  is the total number of E-UTRA reporting criteria configured by E-UTRA PCell except PSCell and SCell carrier frequencies, as specified in TS 36.133 [15] for UE configured with EN-DC.

- For UE configured with NE-DC:  $E_{cat,NE-DC,NR} + E_{cat,NE-DC,E-UTRA}$ , where

 $E_{cat,NE-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PCell and SCells carrier frequencies,

 $E_{cat,NE-DC,E-UTRA} = E_{cat,NE-DC,E-UTRA,inter-RAT} + E_{cat,NE-DC,E-UTRA,intra-RAT}$ , where

 $E_{cat,NE-DC,E-UTRA,inter-RAT}$  is the total number of inter-RAT E-UTRA reporting criteria configured by PCell except E-UTRA PSCell and E-UTRA SCell carrier frequencies, according to Table 9.1.4.2-1,

 $E_{cat,NE-DC,E-UTRA,intra-RAT}$  is the total number of E-UTRA reporting criteria including E-UTRA PSCell and SCell carrier frequencies as specified in TS 36.133 [15] for UE configured with NE-DC.

- For UE configured with SA operation mode:  $E_{\it cat,SA,NR} + E_{\it cat,SA,E-UTRA}$  , where

 $E_{cat,SA,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PCell, and SCells carrier frequencies,

 $E_{cat.SA.E-UTRA}$  is the total number of inter-RAT E-UTRA reporting criteria according to Table 9.1.4.2-1.

- For UE configured with NR-DC:  $E_{cat,NR-DC,NR} + E_{cat,NR-DC,E-UTRA}$ , where

 $E_{cat,NR-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PCell, PSCell and SCells carrier frequencies,

 $E_{cat,NR-DC,E-UTRA}$  is the total number of inter-RAT E-UTRA reporting criteria according to Table 9.1.4.2-1.

Table 9.1.4.2-1: Requirements for reporting criteria per measurement category

Measurement category	Ecat	Note	
Intra-frequency Note 1,2,3,4,5	9	Events for any one or a combination of intra- frequency SS-RSRP, SS-RSRQ, and SS-SINR for NG-RAN intra-frequency cells	
Inter-frequency Note 2,3,4,5	10	Events for any one or a combination of inter- frequency SS-RSRP, SS-RSRQ, and SS-SINR for NG-RAN inter-frequency cells	
Inter-RAT (E-UTRA FDD, E-UTRA TDD) Note 2,4,5	10	Only applicable for UE with this (inter-RAT) capability. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.	
Inter-RAT (E-UTRA FDD, E-UTRA TDD) RSTD Note 2,4,5	1	Inter-RAT RSTD measurement reporting for UE supporting OTDOA; 1 report capable of minimum 16 inter-RAT cell measurements. Only applicable for UE with this (inter-RAT RSTD via LPP [22]) capability. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.	
Inter-RAT (E-UTRA FDD, E-UTRA TDD) RSRP and RSRQ measurements for E-CID Note 2,4,5	1	Inter-RAT RSRP and RSRQ measurements for E-CID reported to E-SMLC via LPP [22]. One report capable of at least in total 10 inter-RAT RSRP and RSRQ measurements. Applicable to UE capable of reporting inter-RAT RSRP and RSRQ to E-SMLC via LPP. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.	
NOTE 1: When the UE is configured with PSCell and SCell carrier frequencies, E <sub>cat</sub> for Intra-frequency is applied per corresponding NR serving frequency.  NOTE 2: Applicable for UE configured with SA NR operation mode.  NOTE 3: Applicable for UE configured with EN-DC operation mode.			
NOTE 4: Applicable for UE configured with NE-DC operation mode.			

# 9.1.5 Carrier-specific scaling factor

This clause specifies the derivation of carrier-specific scaling factor (CSSF) values, which scale the measurement delay requirements given in clause 9.2, 9.3 and 9.4 when UE is configured to monitor multiple measurement objects. The CSSF values are categorized into CSSF $_{outside\_gap,i}$  and CSSF $_{within\_gap,i}$ , for the measurements conducted outside measurement gaps and within measurement gaps, respectively.

# 9.1.5.1 Monitoring of multiple layers outside gaps

NOTE 5: Applicable for UE configured with NR-DC operation mode.

The carrier-specific scaling factor  $CSSF_{outside\_gap,i}$  for measurement object i derived in this chapter is applied to following measurement types:

- Intra-frequency measurement with no measurement gap in clause 9.2.5, when none of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- Intra-frequency measurement with no measurement gap in clause 9.2.5, when part of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

UE is expected to conduct the measurement of this measurement object *i* only outside the measurement gaps.

If the higher layer signaling in TS 38.331 [2] signaling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSF<sub>outside\_gap\_i</sub> and requirements derivied from CSSF<sub>outside\_gap\_i</sub> are not specified.

The UE cell identification and measurement periods derived based on  $CSSF_{outside\_gap,i}$  in clauses 9.2.5.1, 9.2.5.2 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with  $T_{measure\ SFTD1}$  specified in clause 8.1.2.4.25 and clause 8.1.2.4.26.

# 9.1.5.1.1 EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps

For UE configured with the E-UTRA-NR dual connectivity operation, the carrier-specific scaling factor  $CSSF_{outside\_gap,i}$  for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.1-1.

Table 9.1.5.1.1-1: CSSF<sub>outside\_gap,i</sub> scaling factor

Scenario	CSSF <sub>outside_ga</sub> p,i for FR1 PSCC	CSSF <sub>outside_gap</sub> , i for FR1 SCC	CSSFoutside_gap, i for FR2 PSCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is required Note 2	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required
EN-DC with FR1 only CA	1	Number of configured FR1 SCell(s)	N/A	N/A	N/A
EN-DC with FR2 only intra band CA	N/A	N/A	1	N/A	Number of configured FR2 SCells
EN-DC with FR1 +FR2 CA (FR1 PSCell) Note	1	2x(Number of configured SCell(s)-1)	N/A	2	2×(Number of configured SCell(s)-1)
EN-DC with FR1 +FR2 CA (FR2 PSCell) Note 1	N/A	Number of configured SCell(s)	1	N/A	Number of configured SCell(s)

Note 1: Only one NR FR1 operating band and one NR FR2 operating band are included for FR1+FR2 inter-band EN-DC. Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.

# 9.1.5.1.2 SA mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps without NR-DC operation

For UE not configured with NR-DC operation in SA mode, the carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.2-1, which shall also be applied for a UE configured with NE-DC operation.

Table 9.1.5.1.2-1: CSSF<sub>outside gap,i</sub> scaling factor without NR-DC operation in SA mode

Scenario	CSSF <sub>outside_gap</sub> , i for FR1 PCC	CSSF <sub>outside_gap</sub> ,i for FR1 SCC	CSSF <sub>outside_ga</sub> <sub>p,i</sub> for FR2 PCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is required	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required
FR1 only CA	1	Number of configured FR1 SCell(s)	N/A	N/A	N/A
FR2 only intra band CA	N/A	N/A	1	N/A	Number of configured FR2 SCell(s)
FR1 +FR2 CA (FR1 PCell) Note 1	1	2x(Number of configured SCell(s)-1)	N/A	2	2x(Number of configured SCell(s)-1)

Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA. Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.

# 9.1.5.1.3 SA mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps with NR-DC operation

For UE configured with NR-DC operation in SA mode, the carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for intrafrequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.3-1.

Table 9.1.5.1.3-1: CSSF<sub>outside gap,i</sub> scaling factor with NR-DC operation in SA mode

Scenario	CSSF <sub>outside_gap</sub> ,i for FR1 PCC	CSSF <sub>outside_gap,i</sub> for FR1 SCC	CSSFoutside_gap,i for FR2 PSCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required
FR1 + FR2 NR- DC (FR1 PCell and FR2 PScell)	1	2×(Number of configured SCell(s))	2	2×(Number of configured SCell(s))
Note 1: NR-DC ir in FR2.	n Rel-15 only inclu	des the scenarios wh	ere all serving cells ir	MCG in FR1 and all serving cells in SCG

# 9.1.5.2 Monitoring of multiple layers within gaps

The carrier-specific scaling factor  $CSSF_{within\_gap,i}$  for measurement object i derived in this chapter is applied to following measurement types:

- Intra-frequency measurement with no measurement gap in clause 9.2.5, when all of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- Intra-frequency measurement with measurement gap in clause 9.2.6.
- Inter-frequency measurement in clause 9.3
- Inter-RAT measurement in clause 9.4

UE is expected to conduct the measurement of this measurement object *i* only within the measurement gaps.

If the higher layer signaling in TS 38.331 [2] signaling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSF<sub>within\_gap\_i</sub> and requirements derivied from CSSF<sub>outside\_gap\_i</sub> are not specified.

# 9.1.5.2.1 EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed within gaps

Editor's note: The scaling value CSSF<sub>within\_gap,i</sub> below has been derived without considering GSM inter-RAT carriers.

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as  $CSSF_{within\_gap,i}$  and is derived as described in this section.

If measurement object i refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition are derived as below.

For each measurement gap j not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap j.

- An NR carrier is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intrafrequency NR carriers, if the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An interRAT measurement object is a candidate to be measured in all meausrement gaps.

 $R_i$  is the maximal ratio of the number of measurement gap where measurement object i is a candidate to be measured over the number of measurement gap where measurement object i is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 1280ms period.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

### Per gap *j*:

 $M_{intra,i,j}$ : Number of intrafrequency measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.

 $M_{inter,i,j}$ : Number of NR interfrequency measurement objects or NR interRAT measurement objects configured by E-UTRA PCell, EUTRA interfrequency measurement objects configured by E-UTRA PCell, UTRA inter-RAT measurement objects and GSM interRAT measurement objects configured by E-UTRA PCell which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{inter,i,j}$  equals 0.

 $M_{\text{tot,i,j}} = M_{\text{intra,i,j}} + M_{\text{inter,i,j}}$ : Total number of intrafrequency, interfrequency and interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

The carrier specific scaling factor CSSF<sub>within\_gap,i</sub> is given by:

If measGapSharingScheme is equal sharing,  $CSSF_{within\_gap,i} = max(ceil(R_i \times M_{tot,i,j}))$ , where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object i is an intrafrequency measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{intra} \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object *i* is an interfrequency or interRAT measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{inter} \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j}=0$ , where j=0...(160/MGRP)-1

# 9.1.5.2.2 SA mode: carrier-specific scaling factor for SSB-based measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as CSSF<sub>within\_gap,i</sub> and is derived as described in this section.

If measurement object i refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition and the CSSF<sub>within\_gap,i</sub> are derived as below.

For each measurement gap j not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap j.

- An NR carrier is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intrafrequency NR carriers, if the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An interRAT measurement object is a candidate to be measured in all meausrement gaps.

 $R_i$  is the maximal ratio of the number of measurement gap where measurement object i is a candidate to be measured over the number of measurement gap where measurement object i is a candidate and not used for RSTD measurement

with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

Per gap j:

 $M_{intra,i,j}$ : Number of intrafrequency measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.

 $M_{inter,i,j}$ : Number of NR interfrequency and EUTRA interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{inter,i,j}$  equals 0.

 $M_{\text{tot,i,j}} = M_{\text{intra,i,j}} + M_{\text{inter,i,j}}$ : Total number of intrafrequency, interfrequency and interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

The carrier specific scaling factor CSSF<sub>within\_gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within\_gap,i</sub>= max(ceil(R<sub>i</sub>×M<sub>tot,i,j</sub>)), where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object *i* is an intrafrequency measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - ceil( $R_i \times K_{intra} \times M_{intra,i,j}$ ) in gaps where  $M_{inter,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object *i* is an interfrequency or interRAT measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{inter} \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - ceil( $R_i \times M_{inter,i,j}$ ) in gaps where  $M_{intra,i,j}=0$ , where j=0...(160/MGRP)-1

 $CSSF_{within\_gap,k}=1$  during  $T_{Detect, E-UTRAN \, FDD}$  specified in clause 9.4.4.1.2.2 and  $T_{Detect, E-UTRAN \, TDD}$  specified in section 9.4.4.2.2.2, where k is the carrier frequency where the UE is performing cell detection of the inter-RAT E-UTRA OTDOA assistance data reference cell when acquiring the subframe and slot timing of the cell according to clause 9.4.4. In this case, the UE cell identification and measurement periods derived based on  $CSSF_{within\_gap,i}$  in clauses 9.2.5.1, 9.2.5.2, 9.2.6.3, 9.3.4, 9.3.5, 9.4.2.2, and 9.4.2.3 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with  $T_{Detect, E-UTRAN \, FDD}$  and  $T_{Detect, E-UTRAN \, TDD}$ .

# 9.1.5.2.3 NE-DC: carrier-specific scaling factor for SSB-based measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as  $CSSF_{within\_gap,i}$  and is derived as described in this section.

If measurement object i refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured,  $CSSF_{within\_gap,i}$ =1. Otherwise, the the  $CSSF_{within\_gap,i}$  for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition are derived as below.

For each measurement gap *j* not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap *j*.

- An NR carrier is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intrafrequency NR carriers, if the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An interRAT measurement object is a candidate to be measured in all meausrement gaps.

 $R_i$  is the maximal ratio of the number of measurement gap where measurement object i is a candidate to be measured over the number of measurement gap where measurement object i is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 1280ms period.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

### Per gap *j*:

 $M_{intra,i,j}$ : Sum of the number of FR1 intrafrequency measurement objects  $M_{intra-FR1,i,j}$  and the number of FR2 intrafrequency measurement objects  $M_{intra-FR2,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.

 $M_{inter,i,j}$ : Number of NR interfrequency and EUTRA interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{inter,i,j}$  equals 0.

In the case of  $M_{inter,i,j}$  =0 for UE configured with per-UE gap, FR2 intrafrequency measurement objects shall be counted as interfrequency measurement objects in calculating  $M_{inter,i,j}$ , while only FR1 intrafrequency measurement shall be counted as intrafrequency measurement objects in calculating  $M_{inter,i,j}$ .

 $M_{\text{tot,i,j}} = M_{\text{intra,i,j}} + M_{\text{inter,i,j}}$ : Total number of intrafrequency, interfrequency and interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

The carrier specific scaling factor CSSF<sub>within\_gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within\_gap,i</sub>= max(ceil(R<sub>i</sub>×M<sub>tot,i,j</sub>)), where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object i is an intrafrequency measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{intra} \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object i is an interfrequency or interRAT measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - ceil( $R_i \times K_{inter} \times M_{inter,i,j}$ ) in gaps where  $M_{intra,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j}=0$ , where j=0...(160/MGRP)-1
- In the case of M<sub>inter,i,j</sub> =0 for UE configured with per-UE gap, the CSSF<sub>within\_gap,i</sub> calculated for interfrequency measurement objects shall be applied to FR2 intrafrequency measurement objects.

Editor Notes: FFS if better description exists for the case when the number of configured interfrequency and interRAT measurement objects is zero and the UE is configured with per-UE gap

# 9.1.5.2.4 NR-DC: carrier-specific scaling factor for SSB-based measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as CSSF<sub>within gap,i</sub> and is derived as described in this section.

If measurement object i refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition and the CSSF<sub>within\_gap,i</sub> are derived as below.

For each measurement gap *j* not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap *j*.

- An NR carrier is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intrafrequency NR carriers, if the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An interRAT measurement object is a candidate to be measured in all meausrement gaps.

 $R_i$  is the maximal ratio of the number of measurement gap where measurement object i is a candidate to be measured over the number of measurement gap where measurement object i is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 1280ms period.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

Per gap j:

 $M_{intra,i,j}$ : Sum of the number of FR1 intrafrequency measurement objects  $M_{intra-FR1,i,j}$  and the number of FR2 intrafrequency measurement objects  $M_{intra-FR2,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.

 $M_{inter,i,j}$ : Number of NR interfrequency and EUTRA interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{inter,i,j}$  equals 0.

In the case of  $M_{inter,i,j}$  =0 for UE configured with per-UE gap, FR2 intrafrequency measurement objects shall be counted as interfrequency measurement objects in calculating  $M_{inter,i,j}$ , while only FR1 intrafrequency measurement shall be counted as intrafrequency measurement objects in calculating  $M_{inter,i,j}$ .

 $M_{\text{tot,i,j}} = M_{\text{intra,i,j}} + M_{\text{inter,i,j}}$ : Total number of intrafrequency, interfrequency and interRAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

The carrier specific scaling factor CSSF<sub>within\_gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within\_gap,i</sub>=  $\max(\text{ceil}(R_i \times M_{\text{tot,i,j}}))$ , where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object *i* is an intrafrequency measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{intra} \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object *i* is an interfrequency or interRAT measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{inter} \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j}=0$ , where j=0...(160/MGRP)-1
- In the case of M<sub>inter,i,j</sub> =0 for UE configured with per-UE gap, the CSSF<sub>within\_gap,i</sub> calculated for interfrequency measurement objects shall be applied to FR2 intrafrequency measurement objects.

Editor Notes: FFS if better description exists for the case when the number of configured interfrequency and interRAT measurement objects is zero and the UE is configured with per-UE gap

# 9.1.6 Minimum requirement at transitions

When the measurement on one intra-frequency measurement object transitions from measurements performed outside gaps to measurements performed within gaps or vice versa during one measurement period, the cell identification and measurement period requirements with the longer delay apply.

The carrier-specific scaling factor specified in clause 9.1.5 that applies to the other impacted measurement objects will also apply based on the longer measurement or cell identification delay before or after the transition.

When the UE transitions between DRX and non-DRX or when DRX cycle periodicity changes, the cell identification and measurement period requirements apply based on the longer delay before or after the transition.

Subsequent to this measurement period, the cell identification and measurement period requirements on each measurement object are corresponding to the second mode after transition.

# 9.2 NR intra-frequency measurements

# 9.2.1 Introduction

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the SSB of the serving cell indicated for measurement and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSB are also the same.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell or the PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP[3].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in clause 9.2.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC) which provides periodicity, duration and offset information on a window of up to 5ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end - switching time. Switching time is 0.5ms for frequency range FR1 and 0.25ms for frequency range FR2.

# 9.2.2 Requirements applicability

The requirements in clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

# 9.2.3 Number of cells and number of SSB

# 9.2.3.1 Requirements for FR1

For each intra-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements forat least:

- 8 identified cells, and
- 14 SSBs with different SSB index and/or PCI on the intra-frequency layer, where the number of SSBs in the serving cell (except for the SCell) is no smaller than the number of configured RLM-RS SSB resources.

# 9.2.3.2 Requirements for FR2

For each intra-frequency layer, during each Layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 6 identfied cells, and
- 24 SSBs with different SSB index and/or PCI,

where the single serving carrier shall be:

- PCC when UE is configured with SA NR operation mode with PCC in the band; or
- PSCC when UE is configured with EN-DC with PSCC in the band; or
- One of the SCCs on which UE is configured to report SSB based measurements when neither PCC nor PSCC is
  in the same band, so that the selected SCC shall be an SCC where the UE is configured with SS-RSRP
  measurement reporting if such SCC exists, otherwise the selected SCC is up to the UE

UE shall also be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least 2 SSBs on serving cell for each of the other serving carrier(s) in the same band.

# 9.2.4 Measurement Reporting Requirements

# 9.2.4.1 Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

# 9.2.4.2 Event-triggered Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.2.4.3.

# 9.2.4.3 Event Triggered Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T  $_{identify\ intra\ with\ index}$  or T  $_{identify\ intra\ without\ index}$  defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period  $T_{identify\_intra\_without\_index}$  or  $T_{identify\_intra\_with\_index}$  defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period  $T_{identify\_intra\_without\_index}$  or  $T_{identify\_intra\_with\_index}$  defined in clause 9.2.5.1 or clause

9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than  $T_{SSB\_measurement\_period\_intra}$  provided the timing to that cell has not changed more than  $\pm$  3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

# 9.2.5 Intrafrequency measurements without measurement gaps

# 9.2.5.1 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(reportQuantityRsIndexes or maxNrofRSIndexesToReport is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (deriveSSB-IndexFromCell is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that deriveSSB-IndexFromCell is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra}) \ ms$$

$$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}) \ ms$$

#### Where:

T<sub>PSS/SSS\_sync\_intra</sub>: it is the time period used in PSS/SSS detection given in table 9.2.5.1-1, 9.2.5.1-2, 9.2.5.1-4 (deactivated Scell) or 9.2.5.1-5 (deactivated SCell)

 $T_{SSB\_time\_index\_intra}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2.5.1-3 or 9.2.5.1-6 (deactivated SCell)

T<sub>SSB\_measurement\_period\_intra</sub>: equal to a measurement period of SSB based measurement given in table 9.2.5.2-1, table 9.2.5.2-2 table 9.2.5.2-3 (deactivated Scell) or 9.2.5.2-4(deactivated SCell)

CSSF<sub>intra</sub>: it is a carrier specific scaling factor and is determined

- according to CSSF<sub>outside\_gap,i</sub> in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intrafrequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to CSSF<sub>within\_gap,i</sub> in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intrafrequency SMTC is fully overlapping with measurement gaps.
  - if the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

 $M_{pss/sss\_sync\_w/o\_gaps}: For \ a \ UE \ supporting \ FR2 \ power \ class \ 1, \ M_{pss/sss\_sync}=40. \ For \ a \ UE \ supporting \ power \ class \ 2, \\ M_{pss/sss\_sync\_w/o\_gaps}=24. \ For \ a \ UE \ supporting \ FR2 \ power \ class \ 3, \ M_{pss/sss\_sync\_w/o\_gaps}=24. \ For \ a \ UE \ supporting \ FR2 \ power \ class \ 4, \ M_{pss/sss\_sync\_w/o\_gaps}=24$ 

 $M_{meas\_period\_w/o\_gaps}$ : For a UE supporting power class 1,  $M_{meas\_period\_w/o\_gaps}$  =40. For a UE supporting FR2 power class 2,  $M_{meas\_period\_w/o\_gaps}$  =24. For a UE supporting power class 3,  $M_{meas\_period\_w/o\_gaps}$  =24. For a UE supporting power class 4,  $M_{meas\_period\_w/o\_gaps}$  =24.

When intrafrequency SMTC is fully non overlapping with measurement gaps or intrafrequency SMTC is fully overlapping with MGs, Kp=1

When intrafrequency SMTC is partially overlapping with measurent gaps, Kp = 1/(1-(SMTC period / MGRP)), where SMTC period < MGRP

If the higher layer signaling in TS38.331 [2] signaling of smtc2 is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for  $T_{identify\_intra\_with\_index}$  or  $T_{identify\_intra\_with\_index}$ 

For FR2, if *SSB-ToMeasure* is configured, when all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully non-overlapping with the SSB symbols indicated

by SSB-ToMeasure and 1 symbol before each consecutive SSB symbols indicated by SSB-ToMeasure and 1 symbol after each consecutive SSB symbols indicated by SSB-ToMeasure,  $K_{layer1\_measurement}$ = 1, otherwise  $K_{layer1\_measurement}$ =1.5. If SSB-ToMeasure is not configured, when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intrafrequency SMTC,  $K_{layer1\_measurement}$ =1.5, otherwise  $K_{layer1\_measurement}$ =1.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

DRX cycle	T <sub>PSS/SSS_sync_intra</sub>	
No DRX	max( 600ms, ceil( 5 x K <sub>p</sub> ) x SMTC period ) <sup>Note 1</sup> x	
	CSSFintra	
DRX cycle≤ 320ms	max( 600ms, ceil(1.5x 5 x K <sub>p</sub> ) x max(SMTC	
•	period,DRX cycle)) x CSSF <sub>intra</sub>	
DRX cycle>320ms	ceil(5] x K <sub>p</sub> ) x DRX cycle x CSSF <sub>intra</sub>	
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is		
the one used by the cell being identified		

Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	TPSS/SSS_sync_intra
No DRX	max(600ms, ceil(M <sub>pss/sss_sync_w/o_gaps</sub> x K <sub>p</sub> x
	K <sub>layer1_measurement</sub> ) x SMTC period) <sup>Note 1</sup> x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x M <sub>pss/sss_sync_w/o_gaps</sub> x K <sub>p</sub> x
	$K_{layer1\_measurement}$ ) x max(SMTC period,DRX cycle)) x
	CSSFintra
DRX cycle>320ms	ceil(Mpss/sss_sync_w/o_gaps x Kp x Klayer1_measurement) x DRX
	cycle x CSSF <sub>intra</sub>
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is	
the one used by the cell being identified	

Table 9.2.5.1-3: Time period for time index detection (Frequency range FR1)

DRX cycle	T <sub>SSB_time_index_intra</sub>	
No DRX	max(120ms, ceil( 3 x K <sub>p</sub> ) x SMTC period) <sup>Note 1</sup> x	
	CSSF <sub>intra</sub>	
DRX cycle≤ 320ms	max(120ms, ceil (1.5 x 3 x K <sub>p</sub> ) x max(SMTC	
·	period,DRX cycle)) x CSSF <sub>intra</sub>	
DRX cycle>320ms	Ceil(3 x K <sub>p</sub> ) x DRX cycle x CSSF <sub>intra</sub>	
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is		
the one used by the cell being identified		

Table 9.2.5.1-4: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR1)

DRX cycle	TPSS/SSS_sync_intra
No DRX	5 x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	5 x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	5 x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.1-5: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR2)

DRX cycle	T <sub>PSS/SSS_sync_intra</sub>
No DRX	M <sub>pss/sss_sync_w/o_gaps</sub> x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	M <sub>pss/sss_sync_w/o_gaps</sub> x max(measCycleSCell,
	1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	M <sub>pss/sss_sync_w/o_gaps</sub> x max(measCycleSCell, DRX
	cycle) x CSSF <sub>intra</sub>

Table 9.2.5.1-6: Time period for time index detection, deactivated SCell (Frequency range FR1)

DRX cycle	Tssb_time_index_intra
No DRX	3 x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	3 x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	3 x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.1-7: Void

Table 9.2.5.1-8: Void

# 9.2.5.2 Measurement period

The measurement period for intrafrequency measurements without gaps is as shown in table 9.2.5.2-1, 9.2.5.2-2, 9.2.5.2-3 (deactivated SCell) or 9.2.5.2-4(deactivated SCell). If the higher layer signaling in TS38.331 [2] signaling of *smtc2* is present and smtc1 is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tssb\_measurement\_period\_intra

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.5.2-1: Measurement period for intrafrequency measurements without gaps(Frequency FR1)

DRX cycle	T SSB_measurement_period_intra	
No DRX	max(200ms, ceil( 5 x K <sub>p</sub> ) x SMTC period) <sup>Note 1</sup> x	
	CSSFintra	
DRX cycle≤ 320ms	ma(200ms, ceil(1.5x 5 x K <sub>p</sub> ) x max(SMTC period,DRX	
·	cycle)) x CSSF <sub>intra</sub>	
DRX cycle>320ms	ceil( 5 x K <sub>p</sub> ) x DRX cycle x CSSF <sub>intra</sub>	
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is		
the one used by the cell being identified	d	

Table 9.2.5.2-2: Measurement period for intrafrequency measurements without gaps(Frequency FR2)

DRX cycle	T ssb_measurement_period_intra	
No DRX	max(400ms, ceil(M <sub>meas_period_w/o_gaps</sub> x K <sub>p</sub> x	
	K <sub>layer1_measurement</sub> ) x SMTC period) <sup>Note 1</sup> x CSSF <sub>intra</sub>	
DRX cycle ≤ 320ms	max(400ms, ceil(1.5x M <sub>meas_period_w/o_gaps</sub> x K <sub>p</sub> x	
	K <sub>layer1_measurement</sub> ) x max(SMTC period,DRX cycle)) x	
	CSSF <sub>intra</sub>	
DRX cycle>320ms	ceil(M <sub>meas_period_w/o_gaps</sub> xK <sub>p</sub> x K <sub>layerl_measurement</sub> ) x DRX	
	cycle x CSSF <sub>intra</sub>	
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is		
the one used by the cell being identified		

Table 9.2.5.2-3: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR1)

DRX cycle	T SSB_measurement_period_intra
No DRX	5 x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	5 x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	5 x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.2-4: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR2)

DRX cycle	T ssb_measurement_period_intra
No DRX	Mmeas_period_w/o_gaps x measCycleSCell x CSSFintra
DRX cycle ≤ 320ms	M <sub>meas_period_w/o_gaps</sub> x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	M <sub>meas_period_w/o_gaps</sub> x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

# 9.2.5.3 Scheduling availability of UE during intra-frequency measurements

UE are required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by *SSB-ToMeasure* [2], if it is configured; otherwise, all *L* SSB symbols within SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

### 9.2.5.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

# 9.2.5.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If deriveSSB\_IndexFromCell is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signaling of smtc2 is configured, the SMTC periodicity follows smtc2; Otherwise SMTC periodicity follows smtc1.

- If *deriveSSB\_IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

## 9.2.5.3.3 Scheduling availability of UE performing measurements on FR2

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 intra-frequency cell

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration (The signaling <code>deriveSSB\_IndexFromCell</code> is always enabled for FR2) . If the high layer in TS 38.331 [2] signaling of <code>smtc2</code> is configured, the SMTC periodicity follows <code>smtc1</code>.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 intra-frequency cell

- UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration (The signaling deriveSSB\_IndexFromCellc is always enabled for FR2). If the high layer in TS 38.331 [2] signaling of smtc2 is configured, the SMTC periodicity follows smtc2; Otherwise SMTC periodicity follows smtc1.

When intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

If following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than X slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

# 9.2.5.3.4 Scheduling availability of UE performing measurements on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to measurements performed on FR2 serving cell frequency layer.

There are no scheduling restrictions on FR2 serving cell(s) due to measurements performed on FR1 serving cell frequency layer.

### 9.2.5.4 SFTD Measurements between PCell and PSCell

### 9.2.5.4.1 Introduction

This clause contains SFTD measurement requirements for UE which supports NR-DC and is configured with a PSCell in RRC\_CONNECTED state. The UE shall perform SFTD measurement between PCell and PSCell, and report SFTD result with/without SS-RSRP after the network requests with TBD. The overall delay includes RRC procedure delay to be defined in clause 12 in TS 38.331 [2], and SFTD measurement reporting delay in clause 9.2.5.4.3.

### 9.2.5.4.2 SFTD Measurement delay

When no DRX is used in either of PCell and PSCell, the physical layer measurement period of the SFTD measurement shall be  $T_{measure\_SFTD1} = [max(200,[5] \text{ x SMTC period})]$  ms, where the SMTC period refers to the maximum between the configured SMTC period in PCell and PSCell.

When DRX is used in either of the PCell or the PSCell, or in both PCell and PSCell, the physical layer measurement period ( $T_{measure\ SFTD1}$ ) of the SFTD measurement shall be as specified in Table 9.2.5.4.2-1.

Table 9.2.5.4.2-1: SFTD measurement requirement when DRX is used

[max(0.2,[5] x SMTC period)] (Note2)	
[ (- )[-] /] ( /	
[8 x max(DRX cycle, SMTC period)]	
[5 x DRX cycle]	
O.32 <drx 1:="" 2:="" 3:="" [5="" and="" between="" both="" configured="" cycle="" cycle]="" cycles="" cycle≤10.24="" depends="" drx="" drx<="" for="" in="" is="" length="" longer="" maximum="" note="" number="" of="" or="" pcell="" period="" pscell,="" pscell.="" refers="" smtc="" table="" td="" the="" this="" to="" upon="" use="" used="" when="" x=""></drx>	
r	

If PSCell is changed without changing carrier frequency of PSCell, while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed  $T_{measure\_SFTD2}$  as defined by the following expression:

$$T_{measure\_SFTD2} = (M+1)*(T_{measure\_SFTD1}) + M*T_{PSCell\_change\_NRDC}$$

where:

M is the number of times the NR PSCell is changed over the measurement period (T<sub>measure SFTD2</sub>), and

 $T_{PSCell\_change\_NRDC}$  is the time necessary to change the PSCell; it can be up to [25] ms.

If PCell is changed, or if PSCell is changed with different carrier frequency from PSCell, the UE shall terminate SFTD measurements.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in the sub-clause yy.

### 9.2.5.4.3 SFTD Measurement Reporting Delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI<sub>DCCH</sub>. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than measurement period defined in clause 9.2.5.4.2 plus the RRC procedure delay defined in TS 38.331 [2].

# 9.2.6 Intrafrequency measurements with measurement gaps

# 9.2.6.1 Void

# 9.2.6.2 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within  $T_{identify\_intra\_without\_index}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (reportQuantityRsIndexes) or

maxNrofRSIndexesToReport is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (deriveSSB-IndexFromCell is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within T<sub>identify\_intra\_with\_index</sub>. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within T<sub>identify\_intra\_without\_index</sub>. It is assumed that deriveSSB-IndexFromCell is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} \ ms$$

 $T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_ntra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}$ 

#### Where:

T<sub>PSS/SSS sync intra</sub>: it is the time period used in PSS/SSS detection given in table 9.2.6.2-1 or 9.2.6.2-2.

 $T_{SSB\_time\_index\_intra}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2.6.2-3.

T<sub>SSB\_measurement\_period\_intra</sub>: equal to a measurement period of SSB based measurement given in table 9.2.6.2-1 or 9.2.6.2-2.

 $CSSF_{intra}$ : it is a carrier specific scaling factor and is determined according to  $CSSF_{within\_gap,i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

 $M_{pss/sss\_sync\_with\_gaps}$ : For a UE supporting FR2 power class 1,  $M_{pss/sss\_sync\_with\_gaps}$ =40. For a UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_with\_gaps}$ =24. For a UE supporting FR2 power class 3,  $M_{pss/sss\_sync\_with\_gaps}$ =24. For a UE supporting power class 4,  $M_{pss/sss\_sync\_with\_gaps}$ =24.

 $M_{meas\_period\_with\_gaps}$ : For a UE supporting power class 1,  $M_{meas\_period\_with\_gaps}$  =40. For a UE supporting power class 2,  $M_{meas\_period\_with\_gaps}$  =24. For a UE supporting power class 3,  $M_{meas\_period\_with\_gaps}$  =24. For a UE supporting power class 4,  $M_{meas\_period\_with\_gaps}$  =24.

If the higher layer signaling in TS 38.331 [2] signaling of smtc2 is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for  $T_{identify\_intra\_with\_index}$  or  $T_{identify\_intra\_with\_index}$ .

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 9.2.6.1-1, Table 9.2.6.1-2, and Table 9.2.5.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.6.2-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T <sub>PSS/SSS_sync_intra</sub>
No DRX	max(600ms, 5 x max(MGRP, SMTC period)) x
	CSSFintra
DRX cycle≤ 320ms	max(600ms, ceil(1.5x 5) x max(MGRP, SMTC
	period,DRX cycle)) x CSSF <sub>intra</sub>
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.6.2-2: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	T <sub>PSS</sub> /SSS_sync_intra
No DRX	max(600ms, M <sub>pss/sss_sync_with_gaps</sub> x max(MGRP, SMTC
	period)) x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(600ms, ceil(1.5x M <sub>pss/sss_sync_with_gaps</sub> ) x
·	max(MGRP, SMTC period, DRX cycle)) x CSSF <sub>intra</sub>
DRX cycle>320ms	Mpss/sss_sync_with_gaps x max(MGRP, DRX cycle) x
•	CSSF <sub>intra</sub>

Table 9.2.6.2-3: Time period for time index detection (Frequency range FR1)

DRX cycle	T <sub>SSB_time_index_intra</sub>
No DRX	max(120ms, 3 x max(MGRP, SMTC period)) x
	CSSFintra
DRX cycle≤ 320ms	max(120ms, ceil(1.5x 3) x max(MGRP, SMTC
	period,DRX cycle) x CSSF <sub>intra</sub> )
DRX cycle>320ms	3 x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.6.2-7: Void

Table 9.2.6.2-8: Void

# 9.2.6.3 Intrafrequency Measurement Period

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 9.2.6.3-1.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in table 9.2.6.3-2.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 9.2.6.3-1 and Table 9.2.6.3-2, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.6.3-1: Measurement period for intrafrequency measurements with gaps(Frequency Range FR1)

DRX cycle	T SSB_measurement_period_intra
No DRX	max(200ms, 5 x max(MGRP, SMTC period)) x
	CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5) x max(MGRP, SMTC
·	period,DRX cycle)) x CSSF <sub>intra</sub>
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.6.3-2: Measurement period for intrafrequency measurements with gaps(Frequency Range FR2)

DRX cycle	T SSB_measurement_period_intra
No DRX	max(400ms, M <sub>meas_period with_gaps</sub> x max(MGRP, SMTC
	period)) x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x M <sub>meas_period</sub> with_gaps) x max(MGRP, SMTC period, DRX cycle)) Note 1 x
	CSSFintra
DRX cycle>320ms	M <sub>meas_period with_gaps</sub> x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

# 9.3 NR inter-frequency measurements

# 9.3.1 Introduction

A measurement is defined as a SSB based inter-frequency measurement provided it is not defined as in intra-frequency measurement according to clause 9.2.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-frequency cells if carrier frequency information is provided by PCell or the PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

SSB based measurements are configured along with a measurement timing configuration (SMTC) per carrier, which provides periodicity, duration and offset information on a window of up to 5ms where the measurements on the configured inter-frequency carrier are to be performed. For inter-frequency connected mode measurements, one measurement window periodicity may be configured per inter-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB on an inter-frequency measurement object which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. When the inter-frequency cells are in FR2 and the per-FR gap is configured to the UE in EN-DC, SA NR, NE-DC and NR-DC, or the serving cells are in FR2, the inter-frequency cells are in FR2 and the per-UE gap is configured to the UE in SA NR and NR-DC, the switching time is 0.25ms. Otherwise the switching time is 0.5ms.

# 9.3.2 Requirements applicability

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB\_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.
- 9.3.2.1 Void
- 9.3.2.2 Void

## 9.3.3 Number of cells and number of SSB

# 9.3.3.1 Requirements for FR1

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 7 SSBs with different SSB index and/or PCI on the inter-frequency layer.

### 9.3.3.2 Requirements for FR2

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 10 SSBs with different SSB index and/or PCI on the inter-frequency layer, and
- one SSB per identified cell.

# 9.3.4 Inter frequency cell identification

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within  $T_{identify\_inter\_without\_index}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (reportQuantityRsIndexes or maxNrofRSIndexesToReport is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within  $T_{identify\_inter\_with\_index}$ . The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within  $T_{identify\_inter\_with\_uindex}$ .

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter}) \ ms$$

 $T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter}) ms$ 

#### Where:

T<sub>PSS/SSS sync inter</sub>: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

 $T_{SSB\_time\_index\_inter}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-4.

T <sub>SSB\_measurement\_period\_inter</sub>: equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

 $M_{pss/sss\_sync\_inter}$ : For a UE supporting FR2 power class 1,  $M_{pss/sss\_sync\_inter}$  = 64 samples. For a UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_inter}$  = 40 samples. For a UE supporting FR2 power class 3,  $M_{pss/sss\_sync\_inter}$  = 40 samples. For a UE supporting FR2 power class 4,  $M_{pss/sss\_sync}$  = 40 samples.

 $M_{SSB\_index\_inter}$ : For a UE supporting power class 1,  $M_{SSB\_index\_inter} = 40$  samples. For a vehicle mounted UE supporting power class 2,  $M_{pss/sss\_sync\_inter} = 24$  samples. For a UE supporting power class 3,  $M_{SSB\_index\_inter} = 24$  samples. For a UE supporting power class 4,  $M_{meas\_period\_inter} = 24$  samples.

 $M_{meas\_period\_inter}$ : For a UE supporting FR2 power class 1,  $M_{meas\_period\_inter}$  =64 samples. For a vehicle mounted UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_inter}$ =40 samples. For a UE supporting FR2 power class 3,  $M_{meas\_period\_inter}$  =40 samples. For a UE supporting FR2 power class 4,  $M_{meas\_period\_inter}$  = 40 samples.

 $CSSF_{inter}$ : it is a carrier specific scaling factor and is determined according to  $CSSF_{within\_gap,i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection, (Frequency range FR1)

Condition NOTE1,2	T <sub>PSS/SSS_sync_inter</sub>
No DRX	max(600ms, (8) x max(MGRP, SMTC period)) x
	CSSF <sub>inter</sub>
DRX cycle ≤ 320ms	max(600ms, ceil(8x1.5) x max(MGRP, SMTC period,
, and the second	DRX cycle)) x CSSF <sub>inter</sub>
DRX cycle > 320ms	(8) x DRX cycle x CSSF <sub>inter</sub>
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1	
NOTE 2. In ENIDO analysis of the negroup store simple and calculating required values of the plants of the second store and the second store at the second store and the second store at the second s	

NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	TPSS/SSS_sync_inter
No DRX	max(600ms, M <sub>pss/sss_sync_inter</sub> x max(MGRP, SMTC
	period)) x CSSF <sub>inter</sub>
DRX cycle ≤ 320ms	max(600ms, (1.5 x M <sub>pss/sss_sync_inter</sub> ) x max(MGRP,
-	SMTC period, DRX cycle)) x CSSF <sub>inter</sub>
DRX cycle > 320ms	Mpss/sss_sync_inter x DRX cycle x CSSFinter
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for	
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

Condition NOTE1,2	T <sub>SSB_time_index_inter</sub>
No DRX	max(120ms, (3) x max(MGRP, SMTC period)) x
	CSSF <sub>inter</sub>
DRX cycle ≤ 320ms	max(120ms, ceil(3 x 1.5) x max(MGRP, SMTC period,
	DRX cycle)) x CSSF <sub>inter</sub>
DRX cycle > 320ms	(3) x DRX cycle x CSSF <sub>inter</sub>
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for	
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	Tssb_time_index_inter
No DRX	max(200ms, Mssb_index_inter x max(MGRP, SMTC period)) x CSSFinter
DRX cycle ≤ 320ms	max(200ms, (1.5 x M <sub>SSB_index_inter</sub> ) x max(MGRP, SMTC period, DRX cycle)) x CSSF <sub>inter</sub>
DRX cycle > 320ms	M <sub>SSB_index_inter</sub> x DRX cycle x CSSF <sub>inter</sub>
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

9.3.4.1 Void

9.3.4.2 Void

# 9.3.5 Inter frequency measurements

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition NOTE1,2 T SSB_measurement_period_inter		
No DRX	max(200ms, (8) x max(MGRP, SMTC period)) x	
	CSSFinter	
DRX cycle ≤ 320ms	max(200ms, ceil(8 x 1.5) x max(MGRP, SMTC period,	
	DRX cycle)) x CSSF <sub>inter</sub>	
DRX cycle > 320ms	(8) x DRX cycle x CSSF <sub>inter</sub>	
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2 T SSB_measurement_period_inter		
No DRX	max(400ms, M <sub>meas_period_inter</sub> x max(MGRP, SMTC	
	period)) x CSSF <sub>inter</sub>	
DRX cycle ≤ 320ms	max(400ms, (1.5 x M <sub>meas_period_inter</sub> ) x max(MGRP,	
•	SMTC period, DRX cycle)] x CSSF <sub>inter</sub>	
DRX cycle > 320ms		
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

3.3.3.1 VUIU	9.3	.5.1	Void
--------------	-----	------	------

#### 9.3.5.2 Void

## 9.3.5.3 Void

# 9.3.6 NR Inter frequency measurements reporting requirements

# 9.3.6.1 Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

# 9.3.6.2 Event-triggered Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered periodic measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.3.6.3.

# 9.3.6.3 Event-triggered Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within  $T_{identify\_inter\_without\_index}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within  $T_{identify\_inter\_with\_index}$ . Both  $T_{identify\_inter\_with\_index}$  and  $T_{identify\_inter\_with\_index}$  are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period  $T_{identify\_inter\_without\_index}$  or  $T_{identify\_inter\_without\_index}$  defined in clause 9.3.4. If a cell which has been detectable at least for the time period  $T_{identify\_inter\_without\_index}$  or  $T_{identify\_inter\_with\_index}$  defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than T  $SSB\_measurement\_period\_inter$  defined in clause 9.3.5 provided the timing to that cell has not changed more than  $\pm$  3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

# 9.3.7 Void

# 9.3.8 NR Inter frequency SFTD measurement requirements

### 9.3.8.1 Introduction

This clause contains requirements for a UE supporting NR inter-frequency SFTD measurement and is applicable in RRC\_CONNECTED state. The UE shall, depending on network request, perform inter-frequency SFTD measurement and report SFTD result with or without SS-RSRP.. The overall delay includes RRC procedure delay defined in clause 12 in TS 38.331 [2] and SFTD measurement reporting delay in clause 9.3.8.3.

UE which fulfils the requirements in clause 9.3.8 is not supposed to fulfil the requirements defined in clause 9.2.5.4.

# 9.3.8.2 SFTD Measurement delay

The requirements on SFTD measurement delay defined in this section are applicable under the side condition SCH  $\hat{E}s/Iot \ge -3$  dB for the NR cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest neighbour cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more NR cells. The UE may or may not be configured with [cellsForWhichToReportSFTD]. The UE does not expect [cellsForWhichToReportSFTD] to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the neighbour cell regardless of its SSB position in the SMTC period. The SFTD measurement shall be conducted with sustained connection to the PCell and activated SCell(s) in MCG. Depending on capability, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in clause 8.2.2.2.6.

When measurement gaps are provided, the UE shall be capable of finding the NR cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of  $T_{measure\ SFTD1}$  as follows:

- For SFTD measurements without measurement gaps, and without additional SS-RSRP reporting:
  - For NR carrier in FR1: T<sub>measure\_SFTD1</sub> = [14] SMTC periods
  - For NR carrier in FR2: T<sub>measure\_SFTD1</sub> = [112] SMTC periods
- For SFTD measurements in measurement gaps, and without additional SS-RSRP reporting:
  - For NR carrier in FR1:  $T_{measure\_SFTD1} = [CSSF_{inter} \times 8 \times max(MGRP, SMTC period)]$
  - For NR carrier in FR2:  $T_{measure\ SFTD1} = [CSSF_{inter} \times 64 \times max(MGRP, SMTC\ period)]$
- For SFTD measurements without measurement gaps, and with additional SS-RSRP reporting:
  - For NR carrier in FR1: T<sub>measure SFTD1</sub> = [19] SMTC periods
  - For NR carrier in FR2: T<sub>measure SFTD1</sub> = [152] SMTC periods
- For SFTD measurements in measurement gaps, and with additional SS-RSRP reporting:
  - For NR carrier in FR1:  $T_{measure\_SFTD1} = [CSSF_{inter} \times 13 \times max(MGRP, SMTC period)]$
  - For NR carrier in FR2:  $T_{measure\_SFTD1} = [CSSF_{inter} \times 104 \times max(MGRP, SMTC period)]$

where  $CSSF_{inter}$  is a carrier specific scaling factor and is determined according to  $CSSF_{within\_gap,i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

When DRX is used, the same  $T_{measure\_SFTDI}$  as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case PCell is changed due to handover, the UE shall terminate the inter-frequency SFTD measurement.

The measurement accuracy for the SFTD measurement shall fulfill the requirement in clause [10.1.21]. The measurement accuracy for additionally reported SS-RSRP shall fulfil the requirement in clauses 10.1.4.1 and 10.1.5.1 for neighbour cell in FR1 and FR2, respectively.

# 9.3.8.3 SFTD Measurement reporting delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of  $2 \times TTI_{DCCH}$  resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than T<sub>measure\_SFTD1</sub> defined in clause 9.3.8.2.

# 9.4 Inter-RAT measurements

# 9.4.1 Introduction

The requirements in this section are specified for NR–E-UTRAN FDD and NR–E-UTRAN TDD measurements and are applicable without an explicit E-UTRAN neighbour cell list containing physical layer cell identities, for a UE:

- in RRC\_CONNECTED state, and
- configured with SA or NR-DC operation mode or configured in NE-DC operation mode by PCell with NR-E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID) on E-UTRA non-serving frequency carrier, and
- configured with an appropriate measurement gap pattern according to Table 9.1.2-3.

When the UE is in NE-DC operation mode and an NR-E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID) configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements specified in clause 8.19 of TS 36.133 [15] shall apply.

Parameter T<sub>Inter1</sub> used in inter-RAT requirements in clause 9.4 is specified in Table 9.4.1-1.

Table 9.4.1-1: Minimum available time for inter-RAT measurements

Gap Pattern Id	MeasurementGap Length (MGL, ms)	Measurement Gap Repetition Period (MGRP, ms)	Minimum available time for inter- frequency and inter- RAT measurements during 480ms period (Tinter1, ms)
0	6	40	60
1	6	80	30
2	3	40	24 <sup>Note 1</sup>
3	3	80	12 <sup>Note 1</sup>
4	6	20	120 Note 1
6	4	20	72 Note 1,3,6
7	4	40	36 Note 1,4,6
8	4	80	18 <sup>Note 1,5,6</sup>
10	3	20	48 Note 1
NOTE 1: When determing UE requirements using Tinter1 for gap pattern IDs 2, 3, 4,			

- 6, 7, 8, 10, Tinter1 = 60 for gap pattern IDs 2, 4, 6, 7, 10, and Tinter1 = 30 for gap pattern IDs 3 and 8 shall be used.
- NOTE 2: Measurement gaps pattern configurations applicability is as specified in Table 9.1.2-1.
- NOTE 3: When this gap pattern is used, the T<sub>inter</sub> for E-UTRA inter-frequency measurements is 48 ms corresponding to the first 3 ms of the 4 ms gap
- NOTE 4: When this gap pattern is used, the T<sub>inter</sub> for E-UTRA inter-frequency measurements is 24 ms corresponding to the first 3 ms of the 4 ms gap
- NOTE 5: When this gap pattern is used, the T<sub>inter</sub> for E-UTRA inter-frequency measurements is 12 ms corresponding to the first 3 ms of the 4 ms gap
- NOTE 6: This gap pattern is applicable for E-UTRA inter-frequency measurements only if gap based NR measurements are also configured.

A UE configured with gap pattern Id 2, 3 or 10, shall be able to detect a target cell if the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins no earlier than 500  $\mu$ s from the start of the measurement gap and if the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends no later than 500  $\mu$ s before the end of the measurement gap in case of FDD, and no later than 750  $\mu$ s before the end of measurement gap in case of TDD.

A UE configured with gap pattern Id 6, 7 or 8 shall be able to detect a target cell if the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins no earlier than 500  $\mu$ s from the start of the measurement gap and if the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends no later than 1500  $\mu$ s before the end of the measurement gap in case of FDD, and no later than 1750  $\mu$ s before the end of measurement gap in case of TDD.

# 9.4.2 NR – E-UTRAN FDD measurements

# 9.4.2.1 Introduction

The requirements are applicable for NR-E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

# 9.4.2.2 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable FDD cell within  $T_{Identify, E-UTRAN \, FDD}$  according to the following expression:

$$T_{\text{Identify,E-UTRAN FDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1}}} \cdot \text{CSSF}_{\text{interRAT}} \quad ms,$$

where:

 $T_{BasicIdentify} = 480 \text{ ms},$ 

T<sub>Inter1</sub> is defined in clause 9.4.1,

 $CSSF_{interRAT} = CSSF_{within\_gap\_i\_}$  is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in clause 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of  $T_{\text{Measure, E-UTRAN FDD}}$  defined in Table 9.4.2.2-1.

Table 9.4.2.2-1: Measurement period and measurement bandwidth

Configuration	Physical Layer Measurement period: T <sub>Measure, E-UTRAN FDD</sub> [ms]	Measurement bandwidth [RB]
0	480 x CSSF <sub>interRAT</sub>	6
1 (Note 1)	240 x CSSF <sub>interRAT</sub>	50
NOTE 1: This co	nfiguration is optional.	

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

# 9.4.2.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within  $T_{Identify, E-UTRAN \, FDD}$  specified in Table 9.4.2.3-1.

Table 9.4.2.3-1: Requirement to identify a newly detectable E-UTRAN FDD cell

DRX cycle length (s)	T <sub>Identify, E-UTRAN FDD</sub> (s) (DRX cycles)		
	Gap period = 40 ms, 20 ms	Gap period = 80 ms	
≤0.16	Non-DRX requirements in	Non-DRX requirements in	
	clause 9.4.2.2 apply	clause 9.4.2.2 apply	
0.256	5.12*K (20*CSSFinterRAT)	7.68*K (30*CSSF <sub>interRAT</sub> )	
0.32	6.4*K (20*CSSF <sub>interRAT</sub> )	7.68*K (24*CSSF <sub>interRAT</sub> )	
0.32< DRX-cycle ≤	Note1 (20*CSSFinterRAT)	Note1 (20*CSSFinterRAT)	
10.24			
NOTE 1: The time depends on the DRX cycle length.			
NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.2.2.			

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period  $T_{\text{measure}, E-UTRAN FDD}$  specified in Table 9.4.2.3-2.

Table 9.4.2.3-2: Requirement to measure E-UTRAN FDD cells

DRX cycle length (s)	T <sub>measure, E-UTRAN FDD</sub> (s) (DRX cycles)	
≤0.08	Non-DRX requirements in clause 9.4.2.2 apply	
0< DRX-cycle ≤	Note1 (5* CSSF <sub>interRAT</sub> )	
10.24	10.24	
NOTE 1: The time depends on the DRX cycle length.		
NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.2.2.		

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

# 9.4.2.4 Measurement reporting requirements

# 9.4.2.4.1 Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

# 9.4.2.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.2.4.3.

# 9.4.2.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI<sub>DCCH</sub> where TTI<sub>DCCH</sub> is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T  $_{\text{Identify, E-UTRAN FDD}}$  defined in clauses 9.4.2.2 and 9.4.2.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{Identify, E-UTRAN \, FDD}$  becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{Measure, E-UTRAN \, FDD}$  provided the timing to that cell has not changed more than  $\pm 50 \, Ts$  while measurement gap has not been available and the L3 filter has not been used.

# 9.4.3 NR – E-UTRAN TDD measurements

#### 9.4.3.1 Introduction

The requirements are applicable for NR-E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

# 9.4.3.2 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable TDD cell within  $T_{Identify, E-UTRAN \, TDD}$  according to the following expression:

- When configuration 0 or configuration 1 in Table 9.4.3.2-1 is applied,

$$T_{\rm Identify,E-UTRAN\;TDD} = T_{\rm BasicIdentify} \cdot \frac{480}{T_{\rm Inter1}} \cdot {\rm CSSF}_{\rm interRAT} ~ms,$$

- When configuration 2 or configuration 3 in Table 9.4.3.2-1 is applied,

$$T_{\rm Identify,E-UTRAN\,TDD} = T_{\rm BasicIdentify} \cdot \frac{_{480}}{_{T_{\rm Inter1}}} \cdot {\rm CSSF}_{\rm interRAT} + 240 \cdot {\rm CSSF}_{\rm interRAT} \hspace{0.5cm} ms,$$

where:

 $T_{\text{BasicIdentify}} = 480 \text{ ms},$ 

T<sub>Inter1</sub> is defined in clause 9.4.1,

 $CSSF_{interRAT} = CSSF_{within\_gap\_i\_}$  is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in clause 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of  $T_{\text{Measure, E-UTRAN TDD}}$  defined in Table 9.4.3.2-1.

Table 9.4.3.2-1: T<sub>Measure, E-UTRAN TDD</sub> for different configurations

Configuration	Measurement bandwidth		UL/DL sub- If frame (5 ms)	Dw	PTS	T <sub>Measure</sub> , E-UTRAN TDD [ <b>ms</b> ]
	[RB]	DL	UL	Normal CP	Extende d CP	
0	6	2	2	$19760 \cdot T_{\rm s}$	20480· <i>T</i> <sub>s</sub>	480 x CSSF <sub>interRAT</sub>
1 (Note 1)	50	2	2	$19760 \cdot T_{\rm s}$	20480· <i>T</i> <sub>s</sub>	240 x CSSF <sub>interRAT</sub>
2	6	1	3	$19760 \cdot T_{\rm s}$	$20480 \cdot T_{\rm s}$	720 x CSSF <sub>interRAT</sub>
3 (Note 1)	50	1	3	$19760 \cdot T_{\rm s}$	20480· <i>T</i> <sub>s</sub>	480 x CSSF <sub>interRAT</sub>

NOTE 1: This configuration is optional.

NOTE 2: Void

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

# 9.4.3.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within  $T_{Identify, E-UTRAN \, TDD}$  specified in Table 9.4.3.3-1.

Table 9.4.3.3-1: Requirement to identify a newly detectable E-UTRAN TDD cell

DRX cycle length (s)	Tidentify, E-UTRAN TDD (s) (DRX cycles)		
	Gap period = 40 ms, 20	Gap period = 80 ms	
	ms		
≤0.16	Non-DRX requirements in	Non-DRX requirements in	
	clause 9.4.3.2 apply	clause 9.4.3.2 apply	
0.256	5.12*K (20*CSSFinterRAT)	7.68*K (30*CSSFinterRAT)	
0.32	6.4*K (20*CSSF <sub>interRAT</sub> )	7.68*K (24*CSSF <sub>interRAT</sub> )	
0.32< DRX-cycle ≤10.24	Note1 (20*CSSF <sub>interRAT</sub> )	Note1 (20*CSSF <sub>interRAT</sub> )	
NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.3.2.			

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period  $T_{\text{measure}, E-UTRAN TDD}$  specified in Table 9.4.3.3-2.

Table 9.4.3.3-2: Requirement to measure E-UTRAN TDD cells

DRX cycle length (s)	Tmeasure, E-UTRAN TDD (s) (DRX cycles)	
≤0.08	Non-DRX Requirements in clause 9.4.3.2 apply	
0.128	For configuration 2, non-DRX requirements in	
	clause 9.4.3.2 apply,	
	Otherwise: Note1 (5*CSSF <sub>interRAT</sub> )	
0.128 <drx-cycle≤< td=""><td colspan="2">Note1 (5*CSSF<sub>interRAT</sub>)</td></drx-cycle≤<>	Note1 (5*CSSF <sub>interRAT</sub> )	
10.24		
NOTE 1: The time depends on the DRX cycle length.		
NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.3.2.		

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

## 9.4.3.4 Measurement reporting requirements

## 9.4.3.4.1 Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

# 9.4.3.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.3.4.3.

# 9.4.3.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T  $_{Identify, E-UTRAN \, TDD}$  defined in clauses 9.4.3.2 and 9.4.3.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{Identify,\,E-UTRAN\,TDD}$  becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{Measure,\,E-UTRAN\,TDD}$  provided the timing to that cell has not changed more than  $\pm$  50 Ts while measurement gap has not been available and the L3 filter has not been used.

# 9.4.4 Inter-RAT RSTD measurements

### 9.4.4.1 NR – E-UTRAN FDD RSTD measurements

### 9.4.4.1.1 Introduction

The requirements are applicable for NR-E-UTRAN FDD RSTD measurements requested via LPP [22, 27].

The requirements in clause 9.4.4.1 apply when:

- the UE is provided with the LTE timing information via LPP [27], including both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset*, or
- the UE is not provided with nr-LTE-SFN-Offset or nr-LTE-fineTiming-Offset, or
- the UE is provided with *nr-LTE-SFN-Offset* but not with *nr-LTE-fineTiming-Offset*.

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using autonomous gaps to acquire SFN of the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{RSTD\ InterRAT,\ E-UTRAN\ FDD}$  time period starts while meeting all the requirements in clause 9.4.4.1.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to acquire the SFN before the  $T_{RSTD\ InterRAT,\ E-UTRAN\ FDD}$  starts.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps to perform cell detection for the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  time period starts while meeting all the requirements in clause 9.4.4.1.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to detect the cell before the  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  starts.

# 9.4.4.1.2 Requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-RAT E-UTRAN FDD RSTD, specified in TS 38.215 [4], for at least n=16 cells, including the reference cell, within  $T_{RSTD InterRAT, E-UTRAN FDD}$  ms as given below:

$$T_{\text{RSTD InterRAT, E-UTRAN FDD}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \qquad ms$$
,

where

 $T_{RSTD\ InterRAT,\ E-UTRAN\ FDD}$  is the total time for detecting and measuring at least n cells,

 $T_{\rm PRS}$  is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [23], among the measured n cells including the reference cell,

M is the number of PRS positioning occasions as defined in Table 9.4.4.1.2-1, where each PRS positioning occasion comprises of  $N_{PRS}$  (1  $\leq$   $N_{PRS}$   $\leq$ 6) consecutive downlink positioning subframes defined in TS 36.211 [23],

 $CSSF_{interRAT} = CSSF_{within\_gap\_i}$  is the scaling factor determined by the gap sharing scheme for the RSTD measurements on the carrier frequency i as defined in clause 9.1.5.2,

 $\Delta = 160 \cdot \left[ \frac{n}{M} \right]$  ms is the measurement time for a single PRS positioning occasion which includes the sampling time

and the processing time, and

the n cells are distributed on up to two E-UTRAN FDD carrier frequencies.

Table 9.4.4.1.2-1: Number of PRS positioning occasions within  $T_{RSTD\ InterRAT,\ E-UTRAN\ FDD}$ 

Positioning subframe	Number of PRS positioning occasions $M$		
configuration period $T_{ m PRS}$ f2 $^{ m Note1}$		f1 and f2 Note2	
160 ms	16 × CSSF <sub>interRAT</sub>	32 × CSSF <sub>interRAT</sub>	
>160 ms	8 x CSSF <sub>interRAT</sub>	16 × CSSF <sub>interRAT</sub>	
NOTE 1: When inter-RAT E-UTRAN FDD RSTD measurements are performed over the reference cell and neighbour cells, which belong to the E-UTRAN FDD carrier frequency f2.			
and the neighbour cells	RAN FDD RSTD measurements are s, which belong to the E-UTRAN FDI equency f2 respectively.		

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells i out of at least (n-1) neighbor cells within  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  provided:

 $(PRS \, \hat{\mathbb{E}}_s \, / \, Iot)_{ref} \ge -6 \, dB$  for all Frequency Bands for the reference cell,  $(PRS \, \hat{\mathbb{E}}_s \, / \, Iot)_i \ge -13 \, dB$  for all Frequency Bands for neighbour cell i,  $(PRS \, \hat{\mathbb{E}}_s \, / \, Iot)_{ref}$  and  $(PRS \, \hat{\mathbb{E}}_s \, / \, Iot)_i$  conditions apply for all subframes of at least  $L = \frac{M}{2}$  PRS positioning occasions,

PRP 1,2<sub>|dBm</sub> according to TS 36.133 [15, Annex B.2.6] for a corresponding Band,

 $PRS\,\hat{E}_s$  / Iot is defined as the ratio of the average received energy per PRS RE during the useful part of the symbol to the average received power spectral density of the total noise and interference for this RE, where the ratio is measured over all REs which carry PRS.

The time  $T_{RSTD\ InterRAT,\ E-UTRAN\ FDD}$  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message via LPP as specified in TS 38.305 [22], are delivered to the physical layer of the UE.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in clause 10.2.4.

### 9.4.4.1.2.1 RSTD Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

## 9.4.4.1.2.2 Requirements for acquiring the timing of the E-UTRA OTDOA reference cell

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE supporting per-FR gaps may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells in FR1 for acquiring SFN of the reference cell in the E-UTRA OTDOA assistance data, while no autonomous gaps in downlink reception or uplink transmission are allowed in any of the UE serving cells in FR2. The UE, which are only supporting per-UE gaps, may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells for acquiring the SFN of the reference cell in the E-UTRA OTDOA assistance data.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps while indicating *eutra-FineTimingDetection* according to TS 38.331 [2] for detecting the reference cell in the E-UTRA OTDOA assistance data.

When the UE is performing one or both of SFN acquisition or cell detection as specified above, the UE shall be able to determine the timing of the E-UTRA OTDOA assistance data reference cell during the time period

 $T_{RefCell,E-UTRAN} = T_{Detect,E-UTRAN FDD} + T_{MIB} + T_{ECGI}$ ,

#### where

 $T_{Detect, E-UTRAN \, FDD} = T_{Identify, E-UTRAN \, FDD}$  -  $T_{measure, E-UTRAN \, FDD}$  is according to clause 9.4.2 assuming CSSF<sub>interRAT</sub>=1 and it is the time needed to detect the E-UTRA OTDOA assistance data reference cell when the UE needs to acquire the subframe and slot timing of the cell, provided the UE is configured with measurement gaps ( $T_{Detect, E-UTRAN \, FDD}$ =0 when both nr-LTE-SFN-Offset and nr-LTE-fineTiming-Offset are provided in the E-UTRA OTDOA assistance data or the E-UTRA OTDOA assistance data reference cell is known to the UE), and

 $T_{MIB} = 50$  ms is the time required to acquire SFN of the E-UTRA OTDOA assistance data reference cell provided the OTDOA assistance data reference cell is decodable and at least all E-UTRA subframes #0 during  $T_{MIB}$  are available at the UE receiver ( $T_{MIB} = 0$  when nr-LTE-SFN-Offset is provided in the E-UTRA OTDOA assistance data), and

 $T_{ECGI} = 100$  ms is the time required to acquire ECGI of the E-UTRA OTDOA assistance data reference cell when *cellGlobalId* is included in *OTDOA-ReferenceCellInfo* and the UE is not aware of the ECGI of this cell ( $T_{ECGI} = 0$  when *cellGlobalId* is not included in *OTDOA-ReferenceCellInfo* or the UE is aware of the ECGI of the E-UTRA OTDOA assistance data reference cell).

When detecting the E-UTRAN OTDOA reference cell, the requirements in this section shall be met, provided the conditions for the detectable cell are fulfilled according to clause 9.4.2.1. In addition, the MIB of the E-UTRA OTDOA reference cell whose SFN is acquired shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [25].

The requirement for acquiring the timing of the E-UTRA OTDOA reference cell within  $T_{RefCell,E-UTRAN}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

When  $T_{MIB}>0$  and UE is using autonomous gaps during  $T_{MIB}$ , the UE shall transmit at least  $N_{ACK/NACK, MIB, FDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.1.2.2-1. When  $T_{ECGI}>0$  and UE is using autonomous gaps during  $T_{ECGI}$ , the UE shall transmit at least  $N_{ACK/NACK, ECGI, FDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.1.2.2-2. When both  $T_{MIB}>0$  and  $T_{ECGI}>0$  and UE is using autonomous gaps during  $T_{MIB}+T_{ECGI}$ , the UE shall transmit on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created at least  $N_{ACK/NACK, MIB+ECGI, FDD}$  ACK/NACKs specified in Table 9.4.4.1.2.2-3, provided the OTDOA reference cell bandwidth is configured in the OTDOA assistance data [22, 27]. The requirements in Tables 9.4.4.1.2.2-1, 9.4.4.1.2.2-2, and 9.4.4.1.2.2-3 apply, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

Table 9.4.4.1.2.2-1: Number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>

Nack/nack, mib, fdd	Configuration of the serving cell in which the transmitted ACK/NAC are counted	
	Duplex mode configuration	SCS
15	FDD	15 kHz
39	FDD	30 kHz
85	FDD	60 kHz
0	TDD Note 1	15 kHz
4	TDD Note 1	30 kHz
12	TDD Note 1	60 kHz
[46]	TDD Note 2	60 kHz
[104]	TDD Note 2	120 kHz
NOTE 1: TDD UL-DL config	juration is as specified in Table A.3.3.1-1 of TS	38.101-1 [18].

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18]. NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

Table 9.4.4.1.2.2-2: Number of ACK/NACKs transmitted by the UE during Tecsi

Nack/nack, ecgi, fdd	Configuration of the serving cell in which the transmitted ACK/NACKs are counted	
	Duplex mode configuration	scs
66	FDD	15 kHz
145	FDD	30 kHz
298	FDD	60 kHz
28	TDD Note 1	15 kHz
67	TDD Note 1	30 kHz
TBD	TDD Note 1	60 kHz
[175]	TDD Note 2	60 kHz
[363]	TDD Note 2	120 kHz
NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].		

Table 9.4.4.1.2.2-3: Number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>+T<sub>ECGI</sub>

Nack/nack, mib+ecgi, fdd	Configuration of the serving cell in which the transmitted ACK/NACKs are counted	
	Duplex mode configuration	SCS
[84]	FDD	15 kHz
[193]	FDD	30 kHz
[402]	FDD	60 kHz
[28]	TDD Note 1	15 kHz
[81]	TDD Note 1	30 kHz
[TBD]	TDD Note 1	60 kHz
[233]	TDD Note 2	60 kHz
[491]	TDD Note 2	120 kHz
	ration is as specified in Table A.3.3.1-1 of TS	

NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

#### 9.4.4.2 NR – E-UTRAN TDD RSTD measurements

#### 9.4.4.2.1 Introduction

The requirements are applicable for NR-E-UTRAN TDD RSTD measurements requested via LPP [22, 27].

The requirements in clause 9.4.4.1 apply when:

- the UE is provided with the LTE timing information via LPP [27], including both nr-LTE-SFN-Offset and nr-LTE-fineTiming-Offset, or
- the UE is not provided with nr-LTE-SFN-Offset or nr-LTE-fineTiming-Offset, or
- the UE is provided with *nr-LTE-SFN-Offset* but not with *nr-LTE-fineTiming-Offset*.

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using autonomous gaps to acquire SFN of the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{RSTD\,InterRAT,E-UTRAN\,TDD}$  time period starts while meeting all the requirements in clause 9.4.4.2.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to acquire the SFN before the  $T_{\text{RSTD InterRAT,E-UTRANTDD}}$  starts. When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps to perform cell detection for the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{RSTD\,InterRAT,E-UTRAN\,TDD}$  time period starts while meeting all the requirements in clause 9.4.4.2.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to detect the cell before the  $T_{\text{RSTD InterRAT}, \text{E-UTRAN TDD}}$  starts.

### 9.4.4.2.2 Requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-RAT -UTRAN TDD RSTD, specified in TS 38.215 [4], for at least n=16 cells, including the reference cell, within  $T_{RSTD\ InterRAT.E-UTRAN\ TDD}$  ms as given below:

$$T_{RSTD InterRAT, E-UTRAN TDD} = T_{PRS} \cdot (M-1) + \Delta$$
 ms

where

 $T_{RSTD InterRAT, E-UTRAN TDD}$  is the total time for detecting and measuring at least n cells,

 $T_{\rm PRS}$  is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [23], among the measured n cells including the reference cell,

M is the number of PRS positioning occasions as defined in Table 9.4.4.2.2-1, where a PRS positioning occasion is as defined in clause 9.4.4.1.2,

 $CSSF_{interRAT} = CSSF_{within\_gap\_i}$  is the scaling factor determined by the gap sharing scheme for the RSTD measurements on the carrier frequency i as defined in clause 9.1.5.2,

 $\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$  ms is the measurement time for a single PRS positioning occasion which includes the sampling time

and the processing time, and

the n cells are distributed on up to two E-UTRAN TDD carrier frequencies.

Table 9.4.4.2.2-1: Number of PRS positioning occasions within  $T_{RSTD\,InterRAT,\,E-UTRAN\,TDD}$ 

Positioning subframe	Number of PRS positioning occasions $\it M$	
configuration period $T_{ m PRS}$	f2 Note1	f1 and f2 Note2
160 ms	16 × CSSF <sub>interRAT</sub>	32 × CSSFinterRAT
>160 ms	8 x CSSFinterRAT	16 × CSSF <sub>interRAT</sub>
NOTE 1: When inter-RAT E-UTRAN TDD RSTD measurements are performed over the reference cell and neighbour cells, which belong to the E-UTRAN TDD carrier frequency f2.		
NOTE 2: When inter-RAT E-UTRAN TDD RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the E-UTRAN TDD carrier frequency f1 and the E-UTRAN TDD carrier frequency f2 respectively.		

The requirements in this section shall apply for all TDD special subframe configurations specified in TS 36.211 [23] and for the TDD uplink-downlink configurations as specified in Table 9.4.4.2.2-2 for UE requiring measurement gaps for these measurements. For UEs capable of performing inter-RAT RSTD measurements without measurement gaps, TDD uplink-downlink subframe configurations as specified in Table 9.4.4.2.2-3 shall apply.

Table 9.4.4.2.2-2: TDD uplink-downlink subframe configurations applicable for inter-RAT RSTD requirements

PRS Transmission Bandwidth [RB]	Applicable TDD uplink-downlink configurations	
6, 15	3, 4 and 5	
25	1, 2, 3, 4, 5 and 6	
50, 75, 100	0, 1, 2, 3, 4, 5 and 6	
NOTE 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [23].		

Table 9.4.4.2.2-3: TDD uplink-downlink subframe configurations applicable for inter-RAT RSTD requirements without gaps

PRS 1	ransmission Bandwidth [RB]	Applicable TDD uplink-downlink configurations
	6, 15	1, 2, 3, 4 and 5
	25, 50, 75, 100	0, 1, 2, 3, 4, 5 and 6
NOTE:	OTE: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [23].	

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells i out of at least (n-1) neighbor cells within  $T_{\text{RSTD InterRAT.E-UTRANTDD}}$  provided:

 $\left( \operatorname{PRS} \hat{\mathbf{E}}_{s} / \operatorname{Iot} \right)_{ref} \ge -6 \text{ dB for all Frequency Bands for the reference cell,}$   $\left( \operatorname{PRS} \hat{\mathbf{E}}_{s} / \operatorname{Iot} \right)_{i} \ge -13 \text{ dB for all Frequency Bands for neighbour cell } i,$ 

 $\left( \text{PRS } \hat{\mathbf{E}}_{\text{s}} / \text{Iot} \right)_{\text{ref}} \text{ and } \left( \text{PRS } \hat{\mathbf{E}}_{\text{s}} / \text{Iot} \right)_{i} \text{ conditions apply for all subframes of at least } L = \frac{M}{2} \text{ PRS positioning}$ 

occasions.

PRP 1,2|dBm according to TS 36.133 [15, Annex B.2.6] for a corresponding Band,

PRS  $\hat{E}_s$  / Iot is as defined in clause 9.4.4.1.2.

The time  $T_{RSTD\,InterRAT,E-UTRAN\,TDD}$  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message via LPP as specified in TS 38.305 [22], are delivered to the physical layer of the UE.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in clause 10.2.4.

### 9.4.4.2.2.1 RSTD Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

#### 9.4.4.2.2.2 Requirements for acquiring the timing of the E-UTRA OTDOA reference cell

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE supporting per-FR gaps may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells in FR1 for acquiring SFN of the reference cell in the E-UTRA OTDOA assistance data, while no autonomous gaps in downlink reception or uplink transmission are allowed in any of the UE serving cells in FR2. The UE, which are only supporting per-UE gaps, may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells for acquiring the SFN of the reference cell in the E-UTRA OTDOA assistance data.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps while indicating *eutra-FineTimingDetection* according to TS 38.331 [2] for detecting the reference cell in the E-UTRA OTDOA assistance data.

When the UE is performing one or both of SFN acquisition or cell detection as specified above, the UE shall be able to determine the timing of the E-UTRA OTDOA assistance data reference cell during the time period

$$T_{RefCell,E-UTRAN} = T_{Detect, E-UTRAN TDD} + T_{MIB} + T_{ECGI}$$
,

where

 $T_{Detect,\;E-UTRAN\;TDD} = T_{Identify,\;E-UTRAN\;TDD} - T_{measure,\;E-UTRAN\;TDD} \text{ is according to clause } 9.4.3 \text{ assuming CSSF}_{interRAT} = 1 \text{ and it is the time needed to detect the } E-UTRA OTDOA assistance data reference cell when the UE needs to acquire the } T_{Identify,\;E-UTRAN\;TDD} = T_{Identify,\;E-UTRAN\;TDD} - T_{Identify,\;E-UTRAN\;TDD} = T_{Identify,\;E-UTRAN\;TDD} - T_{Identify,\;E-UTRAN\;TDD} = T_{Identify,\;E-UTRAN\;TDD} - T_{Identify,\;E-UTRAN\;TDD} = T_{Identif$ 

subframe and slot timing of the cell, provided the UE is configured with measurement gaps (T<sub>Detect, E-UTRAN TDD</sub>=0 when both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset* are provided in the E-UTRA OTDOA assistance data or the E-UTRA OTDOA assistance data reference cell is known to the UE), and

 $T_{MIB} = 50$  ms is the time required to acquire SFN of the E-UTRA OTDOA assistance data reference cell provided the OTDOA assistance data reference cell is decodable and at least all E-UTRA subframes #0 during  $T_{MIB}$  are available at the UE receiver ( $T_{MIB}$ =0 when nr-LTE-SFN-Offset is provided in the E-UTRA OTDOA assistance data) , and

 $T_{ECGI} = 100$  ms is the time required to acquire ECGI of the E-UTRA OTDOA assistance data reference cell when cellGlobalId is included in OTDOA-ReferenceCellInfo and the UE is not aware of the ECGI of this cell ( $T_{ECGI} = 0$  when cellGlobalId is not included in OTDOA-ReferenceCellInfo or the UE is aware of the ECGI of the E-UTRA OTDOA assistance data reference cell).

When detecting the E-UTRAN OTDOA reference cell, the requirements in this section shall be met, provided the conditions for the detectable cell are fulfilled according to clause 9.4.3.1. In addition, the MIB of an the E-UTRA OTDOA reference cell whose SFN is acquired shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [25].

The requirement for acquiring the timing of the E-UTRA OTDOA reference cell within  $T_{RefCell,E-UTRAN}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

When  $T_{MIB}>0$  and UE is using autonomous gaps during  $T_{MIB}$ , the UE shall transmit at least  $N_{ACK/NACK, MIB, TDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.2.2.2-1. When  $T_{ECGI}>0$  and UE is using autonomous gaps during  $T_{ECGI}$ , the UE shall transmit at least  $N_{ACK/NACK, ECGI, TDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created, specified in Table 9.4.4.2.2.2-2. When both  $T_{MIB}>0$  and  $T_{ECGI}>0$  and UE is using autonomous gaps during  $T_{MIB}+T_{ECGI}$ , the UE shall transmit on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created at least  $N_{ACK/NACK, MIB+ECGI, FDD}$  ACK/NACKs specified in Table 9.4.4.2.2.2-3, provided the OTDOA reference cell bandwidth is configured in the OTDOA assistance data [22, 27]. The requirements in Tables 9.4.4.2.2.2-1, 9.4.4.2.2.2-2 and 9.4.4.2.2.2-3 apply, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

Table 9.4.4.2.2.2-1: Minimum number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>

NACK/NACK, MIB, TDD	Configuration of the serving cell in which the transmitted ACK/NACKs are counted			
	Duplex mode configuration	SCS		
15	FDD	15 kHz		
39	FDD	30 kHz		
85	FDD	60 kHz		
0	TDD Note 1	15 kHz		
4	TDD Note 1	30 kHz		
12	TDD Note 1	60 kHz		
[46]	TDD Note 2	60 kHz		
[104]	TDD Note 2	120 kHz		

Table 9.4.4.2.2.2-2: Number of ACK/NACKs transmitted by the UE during Tecsi

TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

Nack/nack, ecgi, tdd	Configuration of the serving cell in which the transmitted ACK/NACKs are counted					
	Duplex mode configuration	SCS				
66	FDD	15 kHz				
145	FDD	30 kHz				
298	FDD	60 kHz				
28	TDD Note 1	15 kHz				
67	TDD Note 1	30 kHz				
TBD	TDD Note 1	60 kHz				
[175]	TDD Note 2	60 kHz				
TBD[363]	TBD[363] TDD Note 2 120 kHz					
NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].						

Table 9.4.4.2.2.2-3: Number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>+T<sub>ECGI</sub>

Configuration of the serving cell in which the transmitted ACK/NACKs are counted				
Duplex mode configuration	SCS			
FDD	15 kHz			
FDD	30 kHz			
FDD	60 kHz			
TDD Note 1	15 kHz			
TDD Note 1	30 kHz			
TDD Note 1	60 kHz			
TDD Note 2	60 kHz			
TDD Note 2	120 kHz			
	are counter  Duplex mode configuration  FDD  FDD  FDD  TDD Note 1  TDD Note 2			

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18]. NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

#### 9.4.5 Inter-RAT E-CID measurements

#### 9.4.5.1 NR-E-UTRAN FDD E-CID RSRP and RSRQ measurements

#### 9.4.5.1.1 Introduction

The requirements in clause 9.4.5.1. shall apply provided the UE has received *ECID-RequestLocationInformation* message from LMF via LPP requesting the UE to report inter-RAT E-UTRAN FDD E-CID RSRP and RSRQ measurements [22, 27].

## 9.4.5.1.2 Requirements

The requirements in clause 9.4.2 also apply for this section except the measurement reporting requirements. The measurement reporting requirements for E-CID RSRP and RSRQ are defined in clause 9.4.5.1.3.

## 9.4.5.1.3 Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

Reported RSRP and RSRQ measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2 and 10.2.3, respectively.

#### 9.4.5.2 NR-E-UTRAN TDD E-CID RSRP and RSRQ measurements

#### 9.4.5.2.1 Introduction

The requirements in clause 9.4.5.2. shall apply provided the UE has received *ECID-RequestLocationInformation* message from LMF via LPP requesting the UE to report inter-RAT E-UTRAN TDD E-CID RSRP and RSRQ measurements [22, 27].

#### 9.4.5.2.2 Requirements

The requirements in clause 9.4.3 also apply for this section except the measurement reporting requirements. The measurement reporting requirements for E-CID RSRP and RSRQ are defined in clause 9.4.5.2.3.

#### 9.4.5.2.3 Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

Reported RSRP and RSRQ measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2 and 10.2.3, respectively.

# 9.5 L1-RSRP measurements for Reporting

#### 9.5.1 Introduction

When configured by the network, the UE shall be able to perform L1-RSRP measurements of configured CSI-RS, SSB or CSI-RS and SSB resources for L1-RSRP. The measurements shall be performed for a serving cell, including PCell, PSCell, or SCell, on the resources configured for L1-RSRP measurements within the active BWP.

The UE shall be able to measure all CSI-RS resources and/or SSB resources of the *nzp-CSI-RS-ResourceSet* and/or *csi-SSB-ResourceSet* within the CSI-Resource*Config* settings configured for L1-RSRP for the active BWP, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

# 9.5.2 Requirements applicability

The requirements in clause 9.5 apply, provided:

- The CSI-RS or SSB or CSI-RS and SSB resources configured for L1-RSRP measurements are measurable.

An SSB resource configured for L1-RSRP shall be considered measurable when for each relevant SSB the following conditions are met:

- L1-RSRP related side conditions given in clauses 10.1.19.1 and 10.1.20.1 for FR1 and FR2, respectively, for a corresponding band,
- SSB\_RP and SSB Es/Iot according to Annex B.2.4.1 for a corresponding band.

A CSI-RS resource configured for L1-RSRP shall be considered measurable when for each relevant CSI-RS the following conditions are met:

- L1-RSRP related side conditions given in clauses 10.1.19.2 and 10.1.20.2 for FR1 and FR2, repectively, for a corresponding band,
- CSI-RS RP and CSI-RS Ês/Iot according to Annex B.2.4.2 for a corresponding band.

A CSI-RS and SSB resource configured for L1-RSRP shall be considered measurable when the measurable resource conditions are met for both CSI-RS resource and SSB resource.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

# 9.5.3 Measurement Reporting Requirements

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

### 9.5.3.1 Periodic Reporting

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.300 [24].

#### 9.5.3.2 Semi-Persistent Reporting

Reported L1-RSRP measurements contained in a Semi-Persistent L1-RSRP measurement report shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively. This requirement applies for semi-persistent L1-RSRP reports send on PUSCH or PUCCH.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUSCH, if a DCI request has been received.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUCCH, if an activation command [7] has been received.

The UE shall transmit the semi-persistent L1-RSRP reporting on PUSCH or PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.300 [24].

#### 9.5.3.3 Aperiodic Reporting

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 36.300 [24].

# 9.5.4 L1-RSRP measurement requirements

#### 9.5.4.1 SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\_Measurement\_Period\_SSB}$ .

The value of T<sub>L1-RSRP\_Measurement\_Period\_SSB</sub> is defined in Table 9.5.4.1-1 for FR1 and Table 9.5.4.1-2 for FR2, where

- M=1 if higher layer parameter timeRestrictionForChannelMeasurement is configured, and M=3 otherwise

- N=8.

#### For FR1.

- P=1/(1 T<sub>SSB</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

#### For FR2.

- $P=1/(1-T_{SSB}/T_{SMTCperiod})$ , when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- P is  $P_{\text{sharing factor}}$ , when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ).
- P is  $1/(1-T_{SSB}/MGRP-T_{SSB}/T_{SMTCperiod})$ , when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP \text{ and } T_{SSB} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{SSB}/MGRP)^*$   $P_{sharing\ factor}$ , when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5 * T_{SMTCperiod}$
- P is 1/{1-T<sub>SSB</sub> /min (T<sub>SMTCperiod</sub>, MGRP)}, when SSB is partially overlapped with measurement gap (T<sub>SSB</sub> <MGRP) and SSB is partially overlapped with SMTC occasion (T<sub>SSB</sub> < T<sub>SMTCperiod</sub>) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is  $1/(1-T_{SSB}/MGRP)^*$   $P_{sharing\ factor}$ , when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{\text{sharing factor}} = 3$ .

#### Where:

 $T_{SSB} = ssb$ -periodicityServingCell

 $T_{SMTCperiod}$  = the configured SMTC1 period or SMTC2 period if configured

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Editor's Note: FFS what evaluation period would be expected if SSB are in the same OFDM symbols with RLM/BFD/CBD-RS, or other SSB.

Table 9.5.4.1-1: Measurement period T<sub>L1-RSRP\_Measurement\_Period\_SSB</sub> for FR1

Conf	figuration	T <sub>L1-RSRP_Measurement_Period_SSB</sub> (ms)		
no	n-DRX	max(T <sub>Report</sub> , ceil(M*P)*T <sub>SSB</sub> )		
DRX cy	cle ≤ 320ms	max(T <sub>Report</sub> , ceil(1.5*M*P)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))		
DRX cy	/cle > 320ms	ceil(M*P)*T <sub>DRX</sub>		
Note:	configured for	eriodicityServingCell is the periodicity of the SSB-Index r L1-RSRP measurement. T <sub>DRX</sub> is the DRX cycle length.		
	T <sub>Report</sub> is confi	igured periodicity for reporting.		

Table 9.5.4.1-2: Measurement period T<sub>L1-RSRP\_Measurement\_Period\_SSB</sub> for FR2

Configuration	T <sub>L1-RSRP_Measurement_Period_SSB</sub> (ms)				
non-DRX	max(T <sub>Report</sub> , ceil(M*P*N)*T <sub>SSB</sub> )				
DRX cycle ≤ 320ms	max(T <sub>Report</sub> , ceil(1.5*M*P*N)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))				
DRX cycle > 320ms	ceil(1.5*M*P*N)*T <sub>DRX</sub>				
Note: T <sub>SSB</sub> = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. T <sub>DRX</sub> is the DRX cycle length. T <sub>Report</sub> is configured periodicity for reporting.					

## 9.5.4.2 CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$ .

The value of T<sub>L1-RSRP\_Measurement\_Period\_CSI-RS</sub> is defined in Table 9.5.4.2-1 for FR1 and in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / N<sub>res\_per\_set</sub>), where N<sub>res\_per\_set</sub> is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / N<sub>res\_per\_set</sub>), where N<sub>res\_per\_set</sub> is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requriements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has OCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For FR1.

- $P=1/(1-T_{CSI-RS}/MGRP)$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

#### For FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1-T_{CSI-RS}/MGRP)$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- P=1/(1 T<sub>CSI-RS</sub> /T<sub>SMTCperiod</sub>), when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (T<sub>CSI-RS</sub> < T<sub>SMTCperiod</sub>).
- P is  $P_{sharing factor}$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ).
- P is 1/(1- T<sub>CSI-RS</sub> /MGRP T<sub>CSI-RS</sub> /T<sub>SMTCperiod</sub>), when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < T<sub>SMTCperiod</sub>) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP \text{ and } T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- P is  $1/(1-T_{CSI-RS}/MGRP)^*$   $P_{sharing\ factor}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5^*T_{SMTCperiod}$
- P is 1/{1- T<sub>CSI-RS</sub> /min (T<sub>SMTCperiod</sub> ,MGRP)}, when CSI-RS is partially overlapped with measurement gap (T<sub>CSI-RS</sub> < MGRP) and CSI-RS is partially overlapped with SMTC occasion (T<sub>CSI-RS</sub> < T<sub>SMTCperiod</sub>) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is  $1/(1-T_{CSI-RS}/MGRP)$ \*  $P_{sharing\ factor}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- P<sub>sharing factor</sub> is 3.

#### Where:

T<sub>SMTCperiod</sub> = the configured SMTC1 period or SMTC2 period if configured.

T<sub>CSI-RS</sub> = the periodicity of CSI-RS configured for L1-RSRP measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, T<sub>SMTCperiod</sub> corresponds to the value of higher layer parameter *smtc2*; Otherwise T<sub>SMTCperiod</sub> corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Editor's Note: FFS what evaluation period would be expected if CSI-RS are in the same OFDM symbols with RLM/BFD/CBD-RS, or other CSI-RS.

Table 9.5.4.2-1: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS for FR1

Configuration T <sub>L1-RSRP_Measurement_Period_CSI-RS</sub> (ms)		T <sub>L1-RSRP_Measurement_Period_CSI-RS</sub> (ms)		
no	n-DRX	max(T <sub>Report</sub> , ceil(M*P)*T <sub>CSI-RS</sub> )		
DRX cyc	cle ≤ 320ms	max(T <sub>Report</sub> , ceil(1.5*M*P)*max(T <sub>DRX</sub> ,T <sub>CSI-RS</sub> ))		
DRX cy	cle > 320ms	ceil(M*P)*T <sub>DRX</sub>		
Note 1:	Tcsi-Rs is the	periodicity of CSI-RS configured for L1-RSRP		
Note 2:	periodicity for the requireme	ment. T <sub>DRX</sub> is the DRX cycle length. T <sub>Report</sub> is configured y for reporting. ements are applicable provided that the CSI-RS resource		
	configured for 3.	r L1-RSRP measurement is transmitted with Density =		

Table 9.5.4.2-2: Measurement period T<sub>L1-RSRP\_Measurement\_Period\_CSI-RS</sub> for FR2

Configuration		T <sub>L1-RSRP_Measurement_Period_CSI-RS</sub> (ms)	
nc	n-DRX	max(T <sub>Report</sub> , ceil(M*P*N)*T <sub>CSI-RS</sub> )	
DRX cyc	cle ≤ 320ms	max(T <sub>Report</sub> , ceil(1.5*M*P*N)*max(T <sub>DRX</sub> ,T <sub>CSI-RS</sub> ))	
DRX cy	cle > 320ms	ceil(M*P*N)*T <sub>DRX</sub>	
Note 1:	Tcsi-Rs is the	periodicity of CSI-RS configured for L1-RSRP	
measurement. T <sub>DRX</sub> is the DRX cycle length. T <sub>Report</sub> is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density 3.			

# 9.5.5 Measurement restriction for CSI-RS and SSB for L1-RSRP measurement

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

#### 9.5.5.1 Measurement restriction for SSB based L1-RSRP

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement.

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

#### 9.5.5.2 Measurement restriction for CSI-RS based L1-RSRP

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and the
  other CSI-RS. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no
  requirements are defined.
  - The CSI-RS for L1-RSRP measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

# 9.5.6 Scheduling availability of UE during L1-RSRP measurement

Scheduling availability restrictions when the UE is performing L1-RSRP measurement are described in the following clauses.

# 9.5.6.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH in FR1.

# 9.5.6.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as RS for L1-RSRP measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking /CSI-RS for CQI on SSB symbols to be measured for L1-RSRP measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with

restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which the serving cell where L1-RSRP measurement is performed is configured.

## 9.5.6.3 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to L1-RSRP measurement.

- For the case where RS for L1-RSRP measurement is CSI-RS which is QCLed with active TCI state for PDCCH/PDSCH and not in a CSI-RS resource set with repetition ON, and N=1 applies as specified in clause 9.4.5.2
  - There are no scheduling restrictions due to L1-RSRP measurement performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on RS for L1-RSRP measurement symbols to be measured for L1-RSRP measurement.

When intra-band carrier aggregation is performed, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the band on the symbols that fully or partially overlap with restricted symbols.

If following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than X slots.

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

# 9.5.6.4 Scheduling availability of UE performing L1-RSRP measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to L1-RSRP measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on FR1 serving cell(s).

### 9.6 NE-DC: Measurements

#### 9.6.1 Introduction

This clause contains requirements for UE supporting dual connectivity with NR PCell and E-UTRA FDD or TDD PSCell. The requirements apply to UEs that have been configured with NE-DC.

#### 9.6.2 SFTD Measurements

#### 9.6.2.1 Introduction

This clause contains requirements on UE capabilities for reporting of SFN and frame time difference between NR PCell and E-UTRA PSCell in RRC\_CONNECTED state. The requirements comprise measurement reporting delay and

measurement accuracy. The overall measurement reporting delay includes a RRC procedure delay specified in TS 38.331 [2], and the SFTD measurement reporting delay specified below.

#### 9.6.2.2 SFTD Measurement requirements

When no DRX is used in either of the NR PCell and E-UTRA PSCell, the physical layer measurement period of the SFTD measurement shall be  $T_{measure\ SFTD1} = [max(0.2,[5]\ x\ SMTC\ period)]\ s.$ 

When DRX is used in either of the NR PCell or the E-UTRA PSCell, or in both PCell and PSCell, the physical layer measurement period ( $T_{measure\_SFTD1}$ ) of the SFTD measurement shall be as specified in Table 9.6.2.2-1.

Table 9.6.2.2-1: SFTD measurement requirement when DRX is used

DRX cycle length (s) <sup>Note2</sup>	T <sub>measure_</sub> SFTD1 (s)		
DRX cycle≤0.04	[max(0.2,[5] x SMTC period)] (Note1)		
[0.04 <drx cycle≤0.32]<="" td=""><td>[8 x max(DRX cycle, SMTC period)]</td></drx>	[8 x max(DRX cycle, SMTC period)]		
[0.32 <drx cycle≤10.24]<="" td=""><td colspan="3">[5 x DRX cycle]</td></drx>	[5 x DRX cycle]		
Note2: DRX cycle length in this tab configured for PCell or PSC	ends upon the DRX cycle in use le refers to the DRX cycle length ell. When DRX is used in both PCell and this table refers to the longer of the DRX PSCell.		

If PSCell is changed without changing carrier frequency of PSCell while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed  $T_{measure\_SFTD2}$  as defined by the following expression:

$$T_{measure\_SFTD2} = (M+1)*(T_{measure\_SFTD1}) + M*T_{PSCell\_change\_NEDC}$$

where:

M is the number of times the E-UTRA PSCell is changed over the measurement period (T<sub>measure\_SFTD2</sub>), and

T<sub>PSCell\_change\_NEDC</sub> is the time necessary to change the PSCell; it can be up to [25] ms.

If PCell is changed, or if PSCell is changed to a different carrier frequency, the UE shall terminate the SFTD measurement.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in clause TBD.

# 10 Measurement Performance requirements

Editor's note: Accuracy requirement might be an individual top-level chapter to maintain since it is the performance part.

## 10.1 NR measurements

#### 10.1.1 Introduction

Editor's note: new measurement metrics may be added according to the RAN4 discussion. Absolute/relative accuracy requirement, mapping table of RSRP/RSRQ may be specified in this section. The numerology and BW combinations might be reflected in the accuracy requirement table.

The requirements in clause 10.1 apply as follows:

- intra-frequency requirements apply for PCell measurements in SA, NR-DC, or NE-DC operaion mode,
- intra-frequency requirements apply for PSCell measurements in NR-DC or EN-DC operation mode,

- intra-frequency requirements apply for SCell measurements in SA operation mode with NR CA or any MR-DC operation mode with NR CA,
- inter-frequency requirements apply for non-serving cell measurements on NR carrier frequencies.

In the requirements of clause 10.1, the exceptions for side conditions apply as follows:

- for the UE capable of CA but not configured with any SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1 for UE supporting CA in FR1, and clause B.3.2.3 for UE supporting CA in FR2, respectively;
- for the UE capable of CA and configured with at least one SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.2 for UE configured with CA in FR1, and clause B.3.2.4 for UE supporting CA in FR2 respectively;
- for the UE capable of SUL but not configured with SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1;
- for the UE capable of SUL and configured with at least one SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.2 for UE configured with SUL in FR1.

# 10.1.2 Intra-frequency RSRP accuracy requirements for FR1

#### 10.1.2.1 Intra-frequency SS-RSRP accuracy requirements

#### 10.1.2.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.2.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

Accı	ıracy		Conditions					
Normal	Extreme	SSB		lo <sup>Note 1</sup> range				
condition	condition	Ês/lot	NR operating band groups Note 2		Minimur	n lo	Maximum lo	
		dB		dBm/S	CS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70	
		≥-6 dB	NR_FDD_FR1_B	-120.5	-117.5	N/A	-70	
			NR_TDD_FR1_C	-120	-117	N/A	-70	
±4.5	±4.5 ±9		NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70	
			NR_FDD_FR1_G	-118	-115	N/A	-70	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70	
±8	±11	≥-6 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_G, NR_FDD_FR1_G,	N/A	N/A	-70	-50	

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.2.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 10.1.2.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.2-1: SS-RSRP Intra frequency relative accuracy in FR1

Accı	ıracy	Conditions							
Normal	Extreme	SSB	lo <sup>Note 1</sup> range						
condition	condition	Ês/lot Note 2	NR operating band groups Note 4		Minimum Io				
		dB		dBm /	SCS <sub>SSB</sub>				
dB dB				SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
		NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50			
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50		
			NR_TDD_FR1_C	-120	-117	N/A	-50		
±2	±3	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50		
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50		
			NR_FDD_FR1_G	-118	-115	N/A	-50		
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50		
±3	±3	≥-6 dB	Note 3	Note 3	Note 3	N/A	Note 3		

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.
- NOTE 3: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.2.2 Intra-frequency [CSI-RS RSRP] accuracy requirements

# 10.1.3 Intra-frequency RSRP accuracy requirements for FR2

#### 10.1.3.1 Intra-frequency SS-RSRP accuracy requirements

## 10.1.3.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.3.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.3.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2

Accı	ıracy		Conditions							
Normal	Extreme	SSB	lo Note 2 range							
condition	condition	Ês/lot		Minimum	lo	Maximum Io				
			dBm / SC	S <sub>SSB</sub> Note 1						
dB	dB	dB	SCS <sub>SSB</sub> =	SCS <sub>SSB</sub> =	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>				
			120kHz	240kHz						
			Same value	as SSB_RP						
			in Table B.2.2-2,							
±[6]	±[9]	±[9]	±[9]	±[9]	±[9]	≥-6	according to UE Power		N/A	-70
		≥-0	class, oper	rating band						
			and angle	e of arrival						
±[8]	±[11]		N/A		-70	-50				
Note 1: Va										
TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.										

In the test cases, the SSB £s/lot and related parameters may need to be adjusted to ensure Note 2: Note 3: Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.3.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS RSRP levels measured on the same cell in FR2.

The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.3.1.2-1: SS-RSRP Intra frequency relative accuracy in FR2

Accı	ıracy		Conditions					
Normal	Extreme	SSB	lo <sup>Note 2</sup> range			lo <sup>Note 2</sup> ra		nge
condition	condition	Ês/lot	Minim	ium lo	Maximum Io			
			dBm / SC	S <sub>SSB</sub> Note 1				
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>			
±6	±9	≥-6	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		-50			
cl	Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.							
Note 2: Id	·							
a	In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.							

#### 10.1.3.2 Intra-frequency [CSI-RS RSRP] accuracy requirements

# 10.1.4 Inter-frequency RSRP accuracy requirements for FR1

#### 10.1.4.1 Inter-frequency SS-RSRP accuracy requirements

#### 10.1.4.1.1 Absolute Accuracy of SS-RSRP in FR1

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.4.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.4.1.1-1: SS-RSRP Inter frequency Absolute accuracy in FR1

Accuracy			Conditions								
Normal	Extreme	SSB									
condition	condition	Ês/lot Note 2	NR operating band groups Note 3		Minimum	lo	Maximum lo				
		dB		dBm /	SCS <sub>SSB</sub>						
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>				
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70				
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70				
	±9	±9 ≥-6 dB	NR_TDD_FR1_C	-120	-117	N/A	-70				
±4.5			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70				
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70				
			NR_FDD_FR1_G	-118	-115	N/A	-70				
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70				
±8	±11	≥-6 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_B, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H	N/A	N/A	-70	-50				

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: Void

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.4.1.2 Relative Accuracy of SS-RSRP in FR1

The relative accuracy of SS-RSRP in inter frequency case is defined as the RSRP measured from one cell on a frequency in FR1compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.4.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \leq 27 \text{ dB}$
- | Channel 1\_Io -Channel 2\_Io | ≤ 20 dB

Table 10.1.4.1.2-1: SS-RSRP Inter frequency relative accuracy in FR1

Accı	uracy			Condition					
Normal	Normal Extreme		lo <sup>Note 1</sup> range						
condition	condition	Ês/lot Note 2	NR operating band groups Note 3		Minimum Id		Minimum Io		Maximum lo
		dB		dBm/S	CS <sub>SSB</sub>				
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50		
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50		
			NR_TDD_FR1_C	-120	-117	N/A	-50		
±4.5	±6	≥-6 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50		
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50		
			NR_FDD_FR1_G	-118	-115	N/A	-50		
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50		

NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.4.2 Inter-frequency [CSI-RS RSRP] accuracy requirements

# 10.1.5 Inter-frequency RSRP accuracy requirements for FR2

#### 10.1.5.1 Inter-frequency SS-RSRP accuracy requirements

#### 10.1.5.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 10.1.5.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Accuracy **Conditions** lo Note 2 range **Extreme SSB** Normal Ês/lot condition condition Minimum Io Maximum lo dBm / SCS<sub>SSB</sub> Note 1 SCS<sub>SSB</sub> = dB dB dB SCS<sub>SSB</sub> = dBm/BW<sub>Channel</sub> dBm/BW<sub>Channel</sub> 120kHz 240kHz Same value as SSB\_RP in Table B.2.3-2, N/A -70 according to UE Power ±[6] ±[9] ≥-4 class, operating band and angle of arrival N/A -70 -50 ±[8] ±[11]

Table 10.1.5.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

Note 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.5.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell on a frequency in FR2 compared to the SS-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 10.1.5.1.2-1 are valid under the following conditions:

- Conditions defined in 38.101-2 [19] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB RP1_{dBm} SSB RP2_{dBm}| \leq 27dB$
- | Channel 1\_Io -Channel 2\_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.5.1.2-1: SS-RSRP Inter frequency relative accuracy in FR2

Accı	ıracy		Co	nditions			
Normal	Extreme	SSB		lo <sup>Note 2</sup> range	е		
condition	condition	Ês/lot	Minim	ium lo	Maximum Io		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> =	SCS <sub>SSB</sub> =	dBm/BW <sub>Channel</sub>		
			120kHz	240kHz			
			Same value a	as SSB_RP in			
±6	±9	<b>±0</b>	≥-4	Table B.2.3-2, according to		-50	
10		2-4	UE Power class, operating		-50		
				gle of arrival			
			and EIS spheric				
C	clauses 7.3.2	and 7.3.4 of	TS 38.101-2 [19	9]. Applicable si	de condition		
	selected depe						
			ce point, and as	sumed to have	constant EPRE		
	across the bandwidth.						
	adjusted to ensure Ês/lot at UE baseband is above the value defined in						
t	his table.						

### 10.1.5.2 Inter-frequency [CSI-RS RSRP] accuracy requirements

# 10.1.6 RSRP Measurement Report Mapping

The reporting range of SS-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -40 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential SS-RSRP and CSI-RSRP for L1 reporting is defined from 0 dBm to -30 dB with 2 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.6.1-1: SS-RSRP and CSI-RSRP measurement report mapping

Reported value	Measured quantity value(L3 SS-RSRP)	Measured quantity value(L1 SS-RSRP and CSI-RSRP)	Unit
RSRP_0	SS-RSRP<-156	Not valid	dBm
RSRP_1	-156≤ SS-RSRP<-155	Not valid	dBm
RSRP_2	-155≤ SS-RSRP<-154	Not valid	dBm
RSRP_3	-154≤ SS-RSRP<-153	Not valid	dBm
RSRP_4	-153≤ SS-RSRP<-152	Not valid	dBm
RSRP_5	-152≤ SS-RSRP<-151	Not valid	dBm
RSRP_6	-151≤ SS-RSRP<-150	Not valid	dBm
RSRP_7	-150≤ SS-RSRP<-149	Not valid	dBm
RSRP_8	-149≤ SS-RSRP<-148	Not valid	dBm
RSRP_9	-148≤ SS-RSRP<-147	Not valid	dBm
RSRP_10	-147≤ SS-RSRP<-146	Not valid	dBm
RSRP_11	-146≤ SS-RSRP<-145	Not valid	dBm
RSRP_12	-145≤ SS-RSRP<-144	Not valid	dBm
RSRP_13	-144≤ SS-RSRP<-143	Not valid	dBm
RSRP_14	-143≤ SS-RSRP<-142	Not valid	dBm
RSRP_15	-142≤ SS-RSRP<-141	Not valid	dBm
RSRP_16	-141≤ SS-RSRP<-140	RSRP<-140	dBm
RSRP_17	-140≤ SS-RSRP<-139	-140≤RSRP<-139	dBm
RSRP_18	-139≤ SS-RSRP<-138	-139≤ RSRP<-138	dBm
RSRP_111	-46≤ SS-RSRP<-45	-46≤ RSRP<-45	dBm
RSRP_112	-45≤ SS-RSRP<-44	-45≤ RSRP<-44	dBm
RSRP_113	-44≤ SS-RSRP<-43	-44≤ RSRP	dBm
RSRP_114	-43≤ SS-RSRP<-42	Not valid	dBm
RSRP_115	-42≤ SS-RSRP<-41	Not valid	dBm
RSRP_116	-41≤ SS-RSRP<-40	Not valid	dBm
RSRP_117	-40≤ SS-RSRP<-39	Not valid	dBm
RSRP_118	-39≤ SS-RSRP<-38	Not valid	dBm
RSRP_119	-38≤ SS-RSRP<-37	Not valid	dBm
RSRP_120	-37≤ SS-RSRP<-36	Not valid	dBm
RSRP_121	-36≤ SS-RSRP<-35	Not valid	dBm
RSRP_122	-35≤ SS-RSRP<-34	Not valid	dBm
RSRP_123	-34≤ SS-RSRP<-33	Not valid	dBm
RSRP_124	-33≤ SS-RSRP<-32	Not valid	dBm
RSRP_125	-32≤ SS-RSRP<-31	Not valid	dBm
RSRP_126	-31≤ SS-RSRP	Not valid	dBm
RSRP_127 (Note)	Infinity	Infinity	dBm

the value of RSRP\_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [2], but not for the purpose of measurement reporting.

Table 10.1.6.1-2:Differential SS-RSRP and CSI-RSRP measurement report mapping

Reported value	Measured quantity value(difference in measured RSRP from strongest RSRP)	Unit
DIFFRSRP_0	0 ≥ ∆ RSRP>-2	dB
DIFFRSRP_1	-2 ≥ ∆ RSRP>-4	dB
DIFFRSRP_2	-4≥ ∆ RSRP>-6	dB
DIFFRSRP_3	-6≥ ∆ RSRP>-8	dB
DIFFRSRP_4	-8≥ ∆ RSRP>-10	dB
DIFFRSRP_5	-10≥ ∆ RSRP>-12	dB
DIFFRSRP_6	-12≥ ∆ RSRP>-14	dB
DIFFRSRP_7	-14≥ ∆ RSRP>-16	dB
DIFFRSRP_8	-16 ≥ △ RSRP>-18	dB
DIFFRSRP_9	-18 ≥ △ RSRP>-20	dB
DIFFRSRP_10	-20 ≥ ∆ RSRP>-22	dB
DIFFRSRP_11	-22≥ ∆ RSRP>-24	dB
DIFFRSRP_12	-24≥ ∆ RSRP>-26	dB
DIFFRSRP_13	-26≥ ∆ RSRP>-28	dB
DIFFRSRP_14	-28 ≥ △ RSRP>-30	dB
DIFFRSRP_15	-30≥ ∆ RSRP	dB

# 10.1.7 Intra-frequency RSRQ accuracy requirements for FR1

# 10.1.7.1 Intra-frequency SS-RSRQ accuracy requirements in FR1

#### 10.1.7.1.1 Absolute SS-RSRQ Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.7.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.7.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

Accı	ıracy		Conditions  lo Note 1 range							
Normal	Extreme	SSB								
condition	condition	Ês/lot	NR operating band groups Note 3		Minimum	lo	Maximum Io			
		dB		dBm /	SCS <sub>SSB</sub>					
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>			
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50			
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50			
			NR_TDD_FR1_C	-120	-117	N/A	-50			
±2.5	±4	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50			
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50			
			NR_FDD_FR1_G	-118	-115	N/A	-50			
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50			
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2			

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

# 10.1.8 Intra-frequency RSRQ accuracy requirements for FR2

## 10.1.8.1 Intra-frequency SS-RSRQ accuracy requirements in FR2

#### 10.1.8.1.1 Absolute SS-RSRQ Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.8.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.8.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR2

Acc	uracy		Conditions				
Normal	Extreme	SSB		lo <sup>Note 2</sup> rang	е		
condition	condition	Ês/lot		num lo	Maximum Io		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = SCS <sub>SSB</sub> = 120kHz 240kHz		dBm/BW <sub>Channel</sub>		
±2.5	±4	<b>≽-3</b>	B.2.2-2, according	Same value as SSB_RP in Table B.2.2-2, according to UE Power			
±3.5	±4	≥-6	class, operating baarrival	and and angle of	-50		
					auses 7.3.2 and 7.3.4 of		
	TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.						
Note 3:	In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.						

# 10.1.9 Inter-frequency RSRQ accuracy requirements for FR1

#### 10.1.9.1 Inter-frequency SS-RSRQ accuracy requirements in FR1

#### 10.1.9.1.1 Aboslute Accuracy of SS-RSRQ in FR1

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.9.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.9.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR1

Accuracy Conditions									
Normal Extreme		SSB		lo <sup>Note 1</sup> range					
condition	condition	Ês/lot	NP operating hand		lo	Maximum lo			
		dB		dBm /	SCS <sub>SSB</sub>				
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50		
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50		
			NR_TDD_FR1_C	-120	-117	N/A	-50		
±2.5	±4	±4 ≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50		
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50		
			NR_FDD_FR1_G	-118	-115	N/A	-50		
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50		
±3.5	<u>±</u> 4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2		

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.9.1.2 Relative Accuracy of SS-RSRQ in FR1

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR1 compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.9.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB RP1_{dBm} SSB RP2_{dBm}| \leq 27 dB$
- | Channel 1\_Io -Channel 2\_Io |  $\leq$  20 dB

Table 10.1.9.1.2-1: SS-RSRQ Inter frequency relative accuracy in FR1

Accı	ıracy	Conditions								
Normal	Extreme	SSB		Note 1 range						
condition	condition	Ês/lot Note 2	NR operating band groups Note 4	Minimum Io			Maximum lo			
		dB		dBm /	SCS <sub>SSB</sub>					
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>			
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	TBD	TBD	N/A	-50			
			NR_FDD_FR1_B	TBD	TBD	N/A	-50			
±3	±4	≥-3 dB	NR_TDD_FR1_C	TBD	TBD	N/A	-50			
			NR_FDD_FR1_E, NR_TDD_FR1_E	TBD	TBD	N/A	-50			
			NR_FDD_FR1_G	TBD	TBD	N/A	-50			
			NR_FDD_FR1_H	TBD	TBD	N/A	-50			
±4	±4	≥-6 dB	Note 3	Note 3	Note 3	Note 3	Note 3			

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.
- NOTE 3: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.10 Inter-frequency RSRQ accuracy requirements for FR2

## 10.1.10.1 Inter-frequency SS-RSRQ accuracy requirements in FR2

#### 10.1.10.1.1 Aboslute Accuracy of SS-RSRQ in FR2

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.10.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.10.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR2

Acc	uracy			Conditions			
Normal	Extreme	SSB	lo Note 2 range				
condition	condition	Ês/lot	Minim	num lo	Maximum Io		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = SCS <sub>SSB</sub> = 120kHz 240kHz		dBm/BW <sub>Channel</sub>		
±2.5	<u>±</u> 4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power		-50		
±3.5	±4	≥-4	class, operating baarrival	and and angle of	-50		
Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.							
Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.							
	•						

### 10.1.10.1.2 Relative Accuracy of SS-RSRQ in FR2

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR2 compared to the RSRP measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.10.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \le 27 dB$
- | Channel 1\_Io -Channel 2\_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.10.1.2-1: SS-RSRQ Inter frequency relative accuracy in FR2

Accuracy Conditions						
Normal	Extreme	SSB	lo Note 2 range			
condition	condition	Ês/lot	Minim	num lo	Maximum Io	
			dBm / SC	S <sub>SSB</sub> Note 1		
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>	
±3	±4	≥-3	Same value as SS B.2.2-2, according	to UE Power	-50	
±4	±4	≥-4	class, operating band and angle of arrival		-50	
					auses 7.3.2 and 7.3.4 of	
Т	S 38.101-2 [19	]. Applicable s	side condition select	ed depending on an	gle of arrival.	
Note 2: Id	specified at th	ne Reference p	point, and assumed	to have constant EP	RE across the bandwidth.	
Note 3: T	he parameter S	SSB Ês/lot is t	he minimum SSB Ê	s/lot of the pair of ce	lls to which the	
	equirement app			•		
			lot and related para	meters may need to	be adjusted to ensure	
			e the value defined			

# 10.1.11 RSRQ report mapping

#### 10.1.11.1 SS-RSRQ measurement report mapping

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.11.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.11.1-1: SS-RSRQ measurement report mapping

Reported value	Measured quantity value	Unit
SS-RSRQ_0	SS-RSRQ<-43	dB
SS-RSRQ_1	-43≤ SS-RSRQ<-42.5	dB
SS-RSRQ_2	-42.5≤ SS-RSRQ<-42	dB
SS-RSRQ_3	-42≤ SS-RSRQ<-41.5	dB
SS-RSRQ_4	-41.5≤ SS-RSRQ<-41	dB
SS-RSRQ_122	17.5≤ SS-RSRQ<18	dB
SS-RSRQ_123	18≤ SS-RSRQ<18.5	dB
SS-RSRQ_124	18.5≤ SS-RSRQ<19	dB
SS-RSRQ_125	19≤ SS-RSRQ<19.5	dB
SS-RSRQ_126	19.5≤ SS-RSRQ<20	dB
SS-RSRQ_127	20 ≤ SS-RSRQ	dB

# 10.1.12 Intra-frequency SINR accuracy requirements for FR1

#### 10.1.12.1 Intra-frequency SS-SINR accuracy requirements in FR1

#### 10.1.12.1.1 Absolute SS-SINR Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.12.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.

Table 10.1.12.1.1-1: SS-SINR Intra frequency absolute accuracy in FR1

Accı	ıracy			Condi				
Normal	Extreme	SSB	SSB Io Note 1 range					
condition	condition	Ês/lot Note 3	NR operating band groups Note 4		Minimum Io			
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±3.0	±4	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2	

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 3: The requirements apply for SSB Ês/lot ≤ 25 dB.
- NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.13 Intra-frequency SINR accuracy requirements for FR2

#### 10.1.13.1 Intra-frequency SS-SINR accuracy requirements in FR2

#### 10.1.13.1.1 Absolute SS-SINR Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.13.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.13.1.1-1: SS-SINR Intra frequency absolute accuracy in FR2

Acc	curacy			Conditions	
Normal	Extreme	SSB		lo <sup>Note 2</sup> rang	е
condition	condition	Ês/lot	Minimum Io		Maximum Io
			dBm / SC	Sss Note 1	
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>
±3	±4	±4 ≥-3 Same value as SSB_RP in Table B.2.2-2, according to UE Power		-50	
±3.5	±4	≥-6	class, operating band and angle of arrival		-50
					auses 7.3.2 and 7.3.4 of
-	TS 38.101-2 [19	]. Applicable s	side condition select	ed depending on an	gle of arrival.
					RE across the bandwidth.
	3: In the test cases, the SSB Es/lot and related parameters may need to be adjusted to ensure				be adjusted to ensure
l	Ês/lot at UE baseband is above the value defined in this table.				
Note 4:	The requiremen	ts apply for SS	SB Ês/lot ≤ 25 dB.		

# 10.1.14 Inter-frequency SINR accuracy requirements for FR1

# 10.1.14.1 Inter-frequency SS-SINR accuracy requirements in FR1

## 10.1.14.1.1 Aboslute Accuracy of SS-SINR in FR1

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.14.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

Table 10.1.14.1.1-1: SS-SINR Inter frequency absolute accuracy in FR1

Accı	ıracy			Condit				
Normal	Extreme	SSB		lo <sup>l</sup>	lo <sup>Note 1</sup> range			
condition	condition	Ês/lot Note 3	NR operating band groups Note 4		Minimum	lo	Maximum lo	
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±3.0	±4	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
				NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±3.5	<u>±</u> 4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2	

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 3: The requirements apply for SSB Ês/lot ≤ 25 dB.
- NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.14.1.2 Relative Accuracy of SS-SINR in FR1

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR1 compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.14.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \leq 27 \text{ dB}$
- | Channel 1\_Io -Channel 2\_Io |  $\leq$  20 dB

Table 10.1.14.1.2-1: SS-SINR Inter frequency relative accuracy in FR1

Accı	ıracy			Condit				
Normal	Extreme	SSB		lo <sup>Note 1</sup> range				
condition	condition	Ês/lot Note 2,4	NR operating band groups Note 5		Minimum	lo	Maximum lo	
		dB		dBm/S	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 120 kHz	SCS <sub>SSB</sub> = 240 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±3.5	±4	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±4	±4	≥-6 dB	Note 3	Note 3	Note 3	Note 3	Note 3	

- NOTE 1: lo is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.
- NOTE 3: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 4: The requirements apply for SSB Ês/lot ≤ [25] dB.
- NOTE 5: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.15 Inter-frequency SINR accuracy requirements for FR2

#### 10.1.15.1 Inter-frequency SS-SINR accuracy requirements in FR2

#### 10.1.15.1.1 Aboslute Accuracy of SS-SINR in FR2

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.15.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.15.1.1-1: SS-SINR Inter frequency absolute accuracy in FR2

Acc	uracy			Conditions				
Normal	Extreme	SSB		lo <sup>Note 2</sup> rang	je			
condition	condition	Ês/lot		ium lo	Maximum Io			
			dBm / SC	Sss Note 1				
dB	dB dB		SCS <sub>SSB</sub> = SCS <sub>SSB</sub> = 120kHz 240kHz		dBm/BW <sub>Channel</sub>			
±3	<u>±</u> 4	≥-3	Same value as SS B.2.2-2, according	to UE Power	-50			
±3.5	±4	≥-4	class, operating band and angle of arrival		-50			
					lauses 7.3.2 and 7.3.4 of			
			side condition select					
					PRE across the bandwidth.			
Note 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure					be adjusted to ensure			
			above the value defined in this table.					
Note 4: T	he requiremen	ts apply for SS	SB $\hat{E}$ s/lot $\leq$ 25 dB.					

#### 10.1.15.1.2 Relative Accuracy of SS-SINR in FR2

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR2 compared to the SS-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.15.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \le 27 dB$
- | Channel 1\_Io -Channel 2\_Io | ≤ 20 dB

Accuracy

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Conditions

Table 10.1.15.1.2-1: SS-SINR Inter frequency relative accuracy in FR2

			- Containent				
Normal	Extreme	SSB		lo <sup>Note 2</sup> rang	е		
condition	condition	Ês/lot	Minimum Io		Maximum Io		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = SCS <sub>SSB</sub> =		dBm/BW <sub>Channel</sub>		
			120kHz	240kHz			
±3.5	±4	≥-3	B 2 2-2 according to UF Power				
					-50		
±4	±4	≥-6	arrival	and and angle of			
Note 1: V	alues based or	n Refsens and	EIS spherical cove	rage as defined in cl	auses 7.3.2 and 7.3.4 of		
				ed depending on an			
Note 2: Id	specified at th	ne Reference p	point, and assumed	to have constant EP	RE across the bandwidth.		
				s/lot of the pair of ce			
	equirement app			•			
	· · · · · · · · · · · · · · · · · · ·						
	Ês/lot at UE baseband is above the value defined in this table.						
Note 5: T	he requiremen	ts apply for SS	SB Ês/lot ≤ 25 dB.				
		117					

# 10.1.16 SINR report mapping

#### 10.1.16.1 SS-SINR measurement report mapping

The reporting range of SS-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.16.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.16.1-1: SS-SINR measurement report mapping

Reported value	Measured quantity value	Unit
SS-SINR_0	SS-SINR<-23	dB
SS-SINR_1	-23≤ SS-SINR<-22.5	dB
SS-SINR_2	-22.5≤ SS-SINR<-22	dB
SS-SINR_3	-22≤ SS-SINR<-21.5	dB
SS-SINR_4	-21.5≤ SS-SINR<-21	dB
SS-SINR_123	38≤ SS-SINR<38.5	dB
SS-SINR_124	38.5≤ SS-SINR<39	dB
SS-SINR_125	39≤ SS-SINR<39.5	dB
SS-SINR_126	39.5≤ SS-SINR<40	dB
SS-SINR_127	40≤ SS-SINR	dB

## 10.1.17 Power Headroom

#### 10.1.17.1 Power Headroom Report

#### 10.1.17.1.1 Power Headroom Report Mapping

The power headroom reporting range is from -32 ...+38 dB. Table 10.1.17.1-1 defines the report mapping.

Table 10.1.17.1-1: Power headroom report mapping

Reported value	Measured quantity value (dB)
POWER_HEADROOM_0	PH < -32
POWER_HEADROOM_1	-32 ≤ PH < -31
POWER_HEADROOM_2	-31 ≤ PH < -30
POWER_HEADROOM_3	-30 ≤ PH < -29
POWER_HEADROOM_53	20 ≤ PH < 21
POWER_HEADROOM_54	21 ≤ PH < 22
POWER_HEADROOM_55	22 ≤ PH < 24
POWER_HEADROOM_56	24 ≤ PH < 26
POWER_HEADROOM_57	26 ≤ PH < 28
POWER_HEADROOM_58	28 ≤ PH < 30
POWER_HEADROOM_59	30 ≤ PH < 32
POWER_HEADROOM_60	32 ≤ PH < 34
POWER_HEADROOM_61	34 ≤ PH < 36
POWER_HEADROOM_62	36 ≤ PH < 38
POWER_HEADROOM_63	PH ≥ 38

#### 10.1.18 PCMAX.c.f

The UE is required to report the UE configured maximum output power  $(P_{CMAX,c,f})$  together with the power headroom. This clause defines the requirements for the  $P_{CMAX,c,f}$  reporting.

#### 10.1.18.1 Report Mapping

The  $P_{CMAX,c,f}$  reporting range is defined from -29 dBm to 33 dBm with 1 dB resolution. Table 10.1.18.1-1 defines the reporting mapping.

Table 10.1.18.1-1 Mapping of P<sub>CMAX,c.f</sub>

Reported value	Measured quantity value	Unit
PCMAX_C_00	P <sub>CMAX,c,f</sub> < -29	dBm
PCMAX_C_01	$-29 \le P_{CMAX,c,f} < -28$	dBm
PCMAX_C_02	$-28 \le P_{CMAX,c,f} < -27$	dBm
***	***	
PCMAX_C_61	$31 \le P_{CMAX,c,f} < 32$	dBm
PCMAX_C_62	$32 \le P_{CMAX,c,f} < 33$	dBm
PCMAX_C_63	33 ≤ P <sub>CMAX,c,f</sub>	dBm

# 10.1.19 L1-RSRP accuracy requirements for FR1

#### 10.1.19.1 SSB based L1-RSRP accuracy requirements

#### 10.1.19.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.19.1.1-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.

Table 10.1.19.1.1-1: SSB based L1-RSRP absolute accuracy in FR1

Acc	uracy			Condi				
Normal	Extreme	SSB		lo	lo <sup>Note 1</sup> range			
condition	condition	Ês/lot	NR operating band groups Note 2		Minimum	lo	Maximum Io	
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70	
			NR_TDD_FR1_C	-120	-117	N/A	-70	
±5.0	±9.5	≥-3dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70	
			NR_FDD_FR1_G	-118	-115	N/A	-70	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70	
±8.5	±11.5	≥-3dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50	

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.19.1.2 Relative Accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 10.1.19.1.2-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.

Table 10.1.19.1.2-1: SSB based L1-RSRP relative accuracy in FR1

Accı	ıracy		Conditions							
Normal	Extreme	SSB	SSB lo Note 1 range							
condition	condition	Ês/lot Note 2	NR operating band groups Note 4	Minimum Io			Maximum lo			
				dBm /	SCS <sub>SSB</sub>					
dB	dB	dB		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>			
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50			
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50			
			NR_TDD_FR1_C	-120	-117	N/A	-50			
±3	±4	≥-3dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50			
		_	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50			
			NR_FDD_FR1_G	-118	-115	N/A	-50			
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50			

NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of SSBs to which the requirement applies.

NOTE 3: Void

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.19.2 CSI-RS based L1-RSRP accuracy requirements

#### 10.1.19.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.19.2.1-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.19.2.1-1.

Table 10.1.19.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR1

Accı	ıracy				Condition			
Normal	Extreme	CSI-		_	lo <sup>Note</sup>			
condition	condition	RS Ês/lot	NR operating band groups <sup>Note 2</sup>		Mi		Maximum Io	
				dB	m / SCS <sub>CS</sub>	i-RS		
dB	dB	dB		SCS <sub>CSI-</sub> RS = 15	SCS <sub>CSI-</sub> RS = 30	SCS <sub>CSI-</sub> RS = 60	dBm/BW <sub>Channel</sub>	dBm/BWchannel
			ND EDD ED4 A	kHz	kHz	kHz		
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	-114	N/A	-70
±5.0	±9.5	≥-3dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-70
			NR_FDD_FR1_G	-118	-115	-112	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-70
±8.5	±11.5	≥-3dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H	N/A	N/A	N/A	-70	-50

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.19.2.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.19.2.2-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.19.2.2-1.

Table 10.1.19.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR1

Accuracy		Conditions								
		CSI- RS Ês/lot Note 2	lo <sup>Note 1</sup> range							
Normal condition	Extreme condition		NR operating band groups <sup>Note 4</sup>		Maximum Io					
		dB		dBm / SCS <sub>CSI-RS</sub>						
dB	dB			SCScsi- RS = 15 kHz	SCScsi- RS = 30 kHz	SCScsi- RS = 60 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
	±4	≥-3dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50		
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50		
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50		
±3			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50		
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50		
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50		
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50		

NOTE 2: The parameter CSI-RS Ês/lot is the minimum SSB Ês/lot of the pair of CSI-RS resources to which the requirement applies.

NOTE 3: Void

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.20 L1-RSRP accuracy requirements for FR2

### 10.1.20.1 SSB based L1-RSRP accuracy requirements

#### 10.1.20.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.20.1.1-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.20.1.1-1: SSB based L1-RSRP absolute accuracy in FR2

Accı	ıracy	Conditions						
Normal Extreme		SSB						
condition	condition	Ês/lot		Maximum Io				
		dBm / SCS <sub>SSB</sub> Note 2						
dB	dB	dB	SCS <sub>SSB</sub> =	SCS <sub>SSB</sub> =	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
			120kHz	240kHz				

±6.5	±9.5	≥-3	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±8.5	±11.5	≥-3	N/A	-70	-50

NOTE 1: lo specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.20.1.2 Relative Accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 10.1.20.1.2-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Acc	Accuracy		Conditions			
Normal	Extreme	SSB		lo Note 1 range	е	
condition	condition	Ês/lot	Minim	num lo	Maximum Io	
			dBm / SC	S <sub>SSB</sub> Note 3		
dB	dB	dB	SCSssB = SCSssB = 120kHz 240kHz		dBm/BW <sub>Channel</sub>	
±6.5	±9.5	≥-3	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival		-50	
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.						
NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of SSBs to which the requirement applies.					the pair of SSBs	
NOTE 3:	NOTE 3: Values based on Refsens and EIS spherical coverage as defined in					

NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 4: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

### 10.1.20.2 CSI-RS based L1-RSRP accuracy requirements

#### 10.1.20.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.20.2.1-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.20.2.1-1.

Table 10.1.20.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR2

Accuracy				Condit		
Normal	Extreme	CSI-RS		lo Note 1 range		
condition	condition	Ês/lot		Minimum	lo	Maximum Io
			dBm / SCS	dBm / SCS <sub>CSI-RS</sub> Note 2		
dB	dB	dB	SCS <sub>CSI-RS</sub> = 60kHz	SCS <sub>CSI-RS</sub> = 120kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
±6.5	±9.5	≥-3	Same value as CSI- RS_RP in Table B.2.4.2- 2, according to UE Power class, operating band and angle of arrival		N/A	-70
±8.5	±11.5	≥-3	N	/A	-70	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

NOTE 3: In the test cases, the CSI-RS Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.20.2.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.20.2.2-1 are valid under the following conditions:

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.20.2.2-1.

Table 10.1.20.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR2

Accuracy		Conditions			
Normal	Extreme	CSI-RS	lo <sup>Note 1</sup> range		е
condition	condition	Ês/lot	Minimum Io		Maximum lo
			dBm/S	CS <sub>CSI-RS</sub>	
dB	dB	dB	SCS <sub>CSI-RS</sub> = SCS <sub>CSI-RS</sub> = 120kHz		dBm/BW <sub>Channel</sub>

NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

±6.5	±9.5	≥-3	Same value as CSI-RS RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival	-50		
NOTE 1:	1: Io specified at the Reference point, and assumed to have constant EPRE					
	across the bandwidth.					
NOTE 2:			s/lot is the minimum CSI-RS Ês/	lot of the pair of		
			h the requirement applies.			
NOTE 3:			and EIS spherical coverage as			
			TS 38.101-2 [19]. Applicable si	de condition		
	selected depending on angle of arrival.  OTE 4: In the test cases, the CSI-RS Es/lot and related parameters may need to					
NOTE 4:						
	be adjusted to	o ensure Ës/I	ot at UE baseband is above the	e value defined in		
	this table					

## 10.1.21 SFTD accuracy requirements

#### 10.1.21.1 SFTD acuracy requirements for NE-DC

The SFN and frame timing difference (SFTD) is measured between PCell and E-UTRAN PSCell under NE-DC.

The accuracy requirements in Table 10.1.21.1-4 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.1-1.

Table 10.1.21.1-1: PCell lo range conditions in FR1

	lo <sup>Note 1</sup> range						
	NR operating band groups Note 4, 5	Minimum	Maximum Io				
Parameter		dBm/	SCS <sub>SSB</sub>				
		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>			
	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50			
	NR_FDD_FR1_B	-120.5	-117.5	-50			
	NR_TDD_FR1_C	-120	-117	-50			
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50			
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50			
	NR_FDD_FR1_G	-118	-115	-50			
	NR_FDD_FR1_H	-117.5	-114.5	-50			

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The condition level is increased by  $\Delta R_{IB,c}$  as defined in clause 7.3B in TS 38.101-3 [54], depending on E-UTRA NR band combination.
- NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [54], if applicable depending on E-UTRA NR band combination.
- NOTE 4: NR operating band groups are as defined in clause 3.5.
- NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [54] are applicable.

For FR2 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.1-2.

Table 10.1.21.1-2: PCell lo range conditions in FR2

		Io Note 1 range			
Donomoton	Minimum	Maximum Io			
Parameter	dBm/ \$				
	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	GBM/BVV Channel		
Conditions	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	50		
NOTE 2: Va 2 [ NOTE 3: In	IOTE 1: Io is assumed to have constant EPRE across the bandwidth and specified at the ReloTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 a 2 [19]. Applicable side condition selected depending on angle of arrival.  IOTE 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to baseband is above the value defined in this table.				

#### For E-UTRA PSCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [25] Clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- RSRP<sub>|dBm</sub> according to Annex B.3.5 in TS 36.101 [25] for a corresponding Band.
- Io range deifined in Table 10.1.21.1-3.

Table 10.1.21.1-3: E-UTRA PSCell lo range conditions

Davamatav	Io Note 1 range					
Parameter	E-UTRA operating band groups Note 3	Minimum Io	Maximum lo			
		dBm/15kHz Note 2	dBm/BW <sub>Channel</sub>			
	FDD_A, TDD_A	-121	-50			
	FDD_C, TDD_C	-120	-50			
	FDD_D	-119.5	-50			
Conditions	FDD_E, TDD_E	-119	-50			
	FDD_F	-118.5	-50			
	FDD_G	-118	-50			
	FDD_H	-117.5	-50			
	FDD_N	-114.5	-50			

NOTE 1: When in dBm/15kHz, the minimum lo condition is expressed as the average lo per RE over all REs in that symbol. Io may be different in different symbols within a subframe.

NOTE 2: The condition level is increased by Δ>0, when applicable, as described in clauses B.4.2 and B.4.3 in TS36.133 [15].

NOTE 3: E-UTRA operating band groups are as defined in clause 3.5 in TS 36.133 [15].

Table 10.1.21.1-4: SFTD measurement accuracy

	Co	onditions
Accuracy	Ês/lot Note 2	Frequency range
Ts Note 1	dB	
40*64*Tc	> 0 4D	FR1
40*64*Tc	≥-3 dB	FR2

NOTE 1: To is the basic timing unit defined in TS 38.211 [6].

NOTE 2: The parameter Ês/lot is the minimum Ês/lot of the pair of cells to which the requirement applies.

#### 10.1.21.2 SFTD acuracy requirements for NR-DC

The SFN and frame timing difference (SFTD) is measured between PCell in FR1 and PSCell in FR2 under NR dual connectivity.

The accuracy requirements in Table 10.1.21.2-3 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.2-1.

Table 10.1.21.2-1: PCell lo range conditions in FR1

	Io Note 1 range						
	NR operating band groups Note 2	Minim	Minimum Io				
Parameter		dBm/	SCS <sub>SSB</sub>				
		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>			
	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50			
	NR_FDD_FR1_B	-120.5	-117.5	-50			
	NR_TDD_FR1_C	-120	-117	-50			
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50			
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50			
	NR_FDD_FR1_G	-118	-115	-50			
	NR_FDD_FR1_H	-117.5	-114.5	-50			

NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups are as defined in clause 3.5.2.

For FR2 PSCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.2-2.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.21.2-2: PSCell lo range conditions in FR2

		lo <sup>Note 1</sup> range	
Parameter	Minimum	No Note 2, 3	Maximum Io
Parameter	dBm/ \$	SCS <sub>SSB</sub>	dBm/BWchannel
	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	GBIII/B VV Channel
Conditions	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth and specified at the Reference point.

NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

Table 10.1.21.2-3: SFTD measurement accuracy

	Conditions					
Accuracy	Ês/lot Note 2	Frequency range				
Ts Note 1	dB					
[40]*64*Tc	≥ [-3] dB	Between FR1 and FR2				
MOTE 4 T : 0 I : 0 :	:	4.4.503				

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].

NOTE 2: The parameter Ês/lot is the minimum Ês/lot of the pair of cells to which the requirement applies.

#### 10.2 E-UTRAN measurements

#### 10.2.1 Introduction

Accuracy requirements for measurements on E-UTRAN carrier frequencies are specified in clause 10.2 and apply for UE in SA or NR-DC operation mode.

The requirements in clause 10.2 are applicable for a UE:

- in RRC CONNECTED state
- performing measurements with appropriate measurement gaps according to clause 9.1.2.
- that is synchronised to the cell that is measured.

The reported measurement result after layer 1 filtering shall be an estimate of the average value of the measured quantity over the measurement period. The reference point for the measurement result after layer 1 filtering is referred to as point B in the measurement model described in TS 36.300 [24].

The accuracy requirements of E-UTRA measurements in this clause are valid for the reported measurement result after layer 1 filtering. The accuracy requirements are verified from the measurement report at point D in the measurement model having the layer 3 filtering disabled.

If the UE needs measurement gaps to perform the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD measurements, the relevant measurement procedure and measurement gap patterns stated in clause 9.1.2 shall apply.

#### 10.2.2 E-UTRAN RSRP measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RSRP in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RSRP measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRP Accuracy Requirements in clause 9.1.3 of TS 36.133 [15].

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [15] shall apply.

#### 10.2.3 E-UTRAN RSRQ measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RSRQ in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RSRQ measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [15].

The requirements for accuracy of E-UTRA RSRQ measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [15].

The reporting range and mapping specified for RSRQ measurements in clause 9.1.7 of TS 36.133 [15] shall apply.

#### 10.2.4 E-UTRAN RSTD measurements

The requirements in this section are valid for UE supporting this capability.

The measurement period is specified in clauses 9.4.4.1 and 9.4.4.2 for inter-RAT NR — E-UTRAN FDD and inter-RAT NR — E-UTRAN TDD RSTD measurements, respectively.

The accuracy requirements and the corresponding side conditions shall be the same as the inter-frequency measurement accuracy requirements for RSTD measurements in RRC\_CONNECTED in clause 9.1.10.2 of TS 36.133 [15].

If the UE needs measurement gaps to perform the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD RSTD measurements, the relevant measurement procedure and measurement gap patterns stated in clause 9.1.2 shall apply.

The reporting range and mapping for the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD RSTD measurements is the same as specified for RSTD measurements in TS 36.133 [15, clauses 9.1.10.3 and 9.1.10.4].

#### 10.2.5 E-UTRAN RS-SINR measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RS-SINR in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RS-SINR measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RS-SINR Accuracy Requirements in clause 9.1.17.3 of TS 36.133 [15].

The reporting range and mapping for E-UTRA RS-SINR measurements shall be the same as specified for RS-SINR measurements in clause 9.1.17.1 of TS 36.133 [15].

# 11 Measurements Performance Requirements for NR network

Editor's note: network side measurement and mapping tables may be specified in this section. If RAN4 decides to move NR network requirements to gNodeB specification, this section might be removed.

# Annex A (normative): Test Cases

# A.1 Purpose of annex

# A.2 Requirement classification for statistical testing

Requirements in this specification are either expressed as absolute requirements with a single value stating the requirement, or expressed as a success rate. There are no provisions for the statistical variations that will occur when the parameter is tested.

Annex A outlines the tests in more detail and lists the test parameters needed. The test will result in an outcome of a test variable value for the device under test (DUT) inside or outside the test limit. Overall, the probability of a "good" DUT being inside the test limit(s) and the probability of a "bad" DUT being outside the test limit(s) should be as high as possible. For this reason, when selecting the test variable and the test limit(s), the statistical nature of the test is accounted for.

The statistical nature depends on the type of requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a DUT passing the test actually meets the requirements and determines how many times a test has to be repeated and what the pass and fail criteria are. Those aspects are not covered by TS 38.133. The details of the tests on how many times to run it and how to establish confidence in the tests are described in TS 38.533 [5]. This Annex establishes the variable to be used in the test and whether it can be viewed as statistical in nature or not.

# A.2.1 Types of requirements in TS 38.133

# A.2.1.1 Time and delay requirements on UE higher layer actions

A very large part of the RRM requirements are delay requirements:

- In RRC\_IDLE state mobility (clause A.4.x, A.5.x, A.6.x and A.7.x) there is cell re-selection delay.
- In RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6) there is handover delay, cell search delay and measurement reporting delay.
- In RRC Connection Control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2) there is RRC re-establishment delay.

All have in common that the UE is required to perform an action observable in higher layers (e.g. camp on the correct cell) within a certain time after a specific event (e.g. when a new strong pilot or reference signal appears). The delay time is statistical in nature for several reasons, among others that several of the measurements are performed by the UE in a fading radio environment.

The variations make a strict limit unsuitable for a test. Instead there is a condition set for a correct action by the UE, e.g. that the UE shall camp on the correct cell within X seconds. Then the rate of correct events is observed during repeated tests and a limit is set on the rate of correct events, usually 90% correct events are required. How the limit is applied in the test depends on the confidence required, further detailed are in TS 38.533 [5].

## A.2.1.2 Measurements of power levels, relative powers and time

A very large number of requirements are on measurements that the UE performs:

- In RRC\_CONNECTED state mobility (clauses A.4.3, A.5.3, A.6.3 and A.7.3) there are measurement reports.
- In Measurement Performance Requirements (clauses A.4.7, A.5.7, A.6.7 and A.7.7) there are requirements for all type of measurements.

The accuracy requirements on measurements are expressed in this specification as a fixed limit (e.g. +/-X dB), but the measurement error will have a distribution that is not easily confined in fixed limits. Assuming a Gaussian distribution of the error, the limits will have to be set at  $+/-3.29\sigma$  if the probability of failing a "good DUT" in a single test is to be kept at 0.1%. It is more reasonable to set the limit tighter and test the DUT by counting the rate of measurements that are within the limits, in a way similar to the requirements on delay.

## A.2.1.3 Implementation requirements

A few requirements are strict actions the UE should take or capabilities the UE should have, without any allowance for deviations. These requirements are absolute and should be tested as such. Examples are:

- "Event triggered report rate" in RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6)
- "Correct behaviour at time-out" in RRC connection control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2)

## A.2.1.4 Physical layer timing requirements

There are requirements on Timing (clauses A.4.4, A.5.4, A.6.4 and A.7.4). There are both absolute and relative limits on timing accuracy depending upon the type of requirement. Examples are:

- Initial Transmit Timing (clauses A.4.4.1, A.5.4.1, A.6.4.1 and A.7.4.1) has an absolute limit on timing accuracy.
- Timing Advance (clauses A.4.4.2, A.5.4.2, A.6.4.2 and A.7.4.2) has a relative limit on timing accuracy.

# A.3 RRM test configurations

## A.3.1 Reference measurement channels

#### A.3.1.1 PDSCH

#### A.3.1.1.1 FDD

Table A.3.1.1.1: PDSCH Reference Measurement Channels for SCS=15kHz

Parameter	Unit	Value				
Reference channel		SR.1.1 FDD				
Channel bandwidth	MHz	10				
Number of transmitter antennas		1				
Allocated resource blocks for PDSCH Note 1		24				
Allocated slots per Radio Frame		10				
Radio frame containing SSB	slots	Note 5				
Radio frame not containing SSB	slots	10				
MCS index		4				
Modulation		QPSK				
Target Coding Rate		1/3				
Number of control symbols		2				
PDSCH mapping type		Type A				
Information Bit Payload						
For slots with RMSI Note 2	Bits	1864				
Number of Code Blocks per slot		1				
Binary Channel Bits Per slot						
For slots with RMSI Note 2, Note 4	Bits	6048				

Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.

Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.

Note 2: PDSCH is scheduled on the slots with RMSI.

Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].

Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.

#### A.3.1.1.2 TDD

Table A.3.1.1.2-1: PDSCH Reference Measurement Channels for SCS=15kHz

Parameter	Unit		Value
Reference channel		SR.1.1 TDD	
Channel bandwidth	MHz	10	
Number of transmitter antennas		1	
Allocated resource blocks for PDSCH Note 1		24	
Allocated slots per Radio Frame			
Radio frame containing SSB	slots	Note 5	
Radio frame not containing SSB	slots	4	
MCS table		64QAM	
MCS index		4	
Modulation		QPSK	
Target Coding Rate		1/3	
Number of control symbols		2	
PDSCH mapping type		Type A	
Information Bit Payload			
For slots with RMSI Note 2	Bits	1864	
Number of Code Blocks per slot		1	
Binary Channel Bits Per slot			
For slots with RMSI Note 2, Note 4	Bits	6048	

- Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
- Note 2: PDSCH is scheduled on the slots with RMSI.
- Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].
- Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
- Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.

Table A.3.1.1.1-2: PDSCH Reference Measurement Channels for SCS=30kHz

Parameter	Unit		Value
Reference channel		SR.2.1 TDD	
Channel bandwidth	MHz	40	
Number of transmitter antennas		1	
Allocated resource blocks for PDSCH Note 1		24	
Allocated slots per Radio Frame			
Radio frame containing SSB	slots	Note 5	
Radio frame not containing SSB	slots	10	
MCS table		64QAM	
MCS index		4	
Modulation		QPSK	
Target Coding Rate		1/3	
Number of control symbols		2	
PDSCH mapping type		Type A	
Information Bit Payload			
For slots with RMSI Note 2	Bits	1864	
Number of Code Blocks per slot		1	
Binary Channel Bits Per slot			
For slots with RMSI Note 2, Note 4	Bits	6048	

- Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
- Note 2: PDSCH is scheduled on the slots with RMSI.
- Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].
- Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
- Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.

Table A.3.1.1.1-3: PDSCH Reference Measurement Channels for SCS=120kHz

Parameter	Unit		Value
Reference channel		SR.3.1 TDD	
Channel bandwidth	MHz	100	
Number of transmitter antennas		1	
Allocated resource blocks for PDSCH Note 1		24	
Allocated slots per Radio Frame			
Radio frame containing SSB	slots	Note 5	
Radio frame not containing SSB	slots	48	
MCS table		64QAM	
MCS index		4	
Modulation		QPSK	
Target Coding Rate		1/3	
Number of control symbols		2	
PDSCH mapping type		Type A	
Information Bit Payload			
For slots with RMSI Note 2	Bits	1864	
Number of Code Blocks per slot		1	
Binary Channel Bits Per slot			
For slots with RMSI Note 2, Note 4	Bits	6048	

- Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block
- Note 2: PDSCH is scheduled on the slots with RMSI.
- Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].
- Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
- Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in section A.3.10.

# A.3.1.2 CORESET for RMSI scheduling

#### A.3.1.2.1 FDD

Table A.3.1.2.1-1: RMSI CORESET Reference Channel for FDD with SCS=15KHz

Parameter	Unit		Value
Reference channel		CR.1.1 FDD	
Channel bandwidth	MHz	10	
Subcarrier spacing for RMSI CORESET	KHz	15	
Allocated resource blocks for RMSI CORESET Note 7		24	
Subcarrier spacing for SSB	KHz	15	
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1	
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note8)	
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4	
Number of transmitter antennas		1	
Duration of RMSI CORESET Note 7	symbols	2	
DCI Format Note 1		Note 2	
Aggregation level	CCE	8	
DMRS precoder granularity		6	
REG bundle size	_	6	
Mapping from REG to CCE		Distributed	
Cell ID		Note 5	
Payload (without CRC)	Bits	Note 6	

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3]
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

#### A.3.1.2.2 TDD

Table A.3.1.2.2-1: RMSI CORESET Reference Channel for TDD with SCS=15KHz

Parameter	Unit		Va	alue	
Reference channel		CR.1.1 TDD			
Channel bandwidth	MHz	10			
Subcarrier spacing	KHz	15			
Allocated resource blocks for RMSI CORESET Note 7		24			
Index of transmited SSB within an SS-Burst		#0			
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1			
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)			
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4			
Number of transmitter antennas		1			
Duration of RMSI CORESET Note 7	symbols	2			
DCI Format Note 1		Note 2			
Aggregation level	CCE	8			
DMRS precoder granularity		6			
REG bundle size		6			
Mapping from REG to CCE		Distributed			
Cell ID		Note 5			
Payload (without CRC)	Bits	Note 6			

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3].
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

Table A.3.1.2.2-2: RMSI CORESET Reference Channel for TDD with SCS=30KHz

Parameter	Unit		Value
Reference channel		CR.2.1 TDD	
Channel bandwidth	MHz	40	
Subcarrier spacing	KHz	30	
Allocated resource blocks for RMSI CORESET Note 7		24	
Index of transmited SSB within an SS-Burst		#0	
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1	
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)	
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4	
Number of transmitter antennas		1	
Duration of RMSI CORESET Note 7	symbols	2	
DCI Format Note 1		Note 2	
Aggregation level	CCE	8	
DMRS precoder granularity		6	
REG bundle size		6	
Mapping from REG to CCE		Distributed	
Cell ID		Note 5	
Payload (without CRC)	Bits	Note 6	

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-6 in TS 38.213 [3].
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

Table A.3.1.2.2-3: RMSI CORESET Reference Channel for TDD with SCS=120KHz

Parameter	Unit		Value	
Reference channel		CR.3.1		
		TDD		
Channel bandwidth	MHz	100		
Subcarrier spacing	KHz	120		
Allocated resource blocks for RMSI CORESET Note 7		24		
Subcarrier spacing for SSB	KHz	120		
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1		
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)		
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4		
Number of transmitter antennas		1		
Duration of RMSI CORESET Note 7	symbols	2		
DCI Format Note 1		Note 2		
Aggregation level	CCE	8		
DMRS precoder granularity		6		
REG bundle size		6		
Mapping from REG to CCE		Distributed		
Cell ID		Note 5		
Payload (without CRC)	Bits	Note 6		-

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-12 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [3].
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

# A.3.1.3 CORESET for RMC scheduling

#### A.3.1.3.1 **FDD**

Table A.3.1.3.1-1: Control Channel RMC for FDD with SCS=15KHz

Parameter	Unit			Value		
Reference channel		CCR.1.1 FDD				
Channel bandwidth	MHz	10				
Subcarrier spacing	KHz	15				
Allocated resource blocks for CORESET Note 3		24				
Number of transmitter		1				
antennas						
Duration of CORESET	symbols	2				
REG bundle size		6				
DMRS precoder granularity		Same as REG bundle size				
CCE to REG mapping		Interleaved				
Interleave n_shift		0				
Interleave size		2				
Beamforming Pre-Coder		N/A				
Aggregation level	CCE	8				
DCI formats		Note 1				
Payload size (without CRC)	bits	Note 2				

Note 1:

Note 2:

DCI format shall depend upon the test configuration.
Payload size shall depend upon the test configuration
Allocated in the same resource blocks where the associated RMC is scheduled. Note 3:

#### A.3.1.3.2 TDD

Table A.3.1.3.2-1: Control Channel RMC for TDD with SCS=15KHz

Parameter	Unit			Value		
Reference channel		CCR.1.1 TDD				
Channel bandwidth	MHz	10				
Subcarrier spacing	KHz	15				
Allocated resource blocks for CORESET Note 3		24				
Number of transmitter antennas		1				
Duration of CORESET	symbols	2				
REG bundle size		6				
DMRS precoder granularity		Same as REG bundle size				
CCE to REG mapping		Interleaved				
Interleave n_shift		0				
Interleave size		2				
Beamforming Pre-Coder		N/A				
Aggregation level	CCE	8				
DCI formats		Note 1				
Payload size (without CRC)	bits	Note 2				

Note 1: DCI format shall depend upon the test configuration.

Note 2: Payload size shall depend upon the test configuration

Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.

Table A.3.1.3.2-2: Control Channel RMC for TDD with SCS=30KHz

Parameter	Unit			Value		
Reference channel		CCR.2.1 TDD				
Channel bandwidth	MHz	40				
Subcarrier spacing	KHz	30				
Allocated resource blocks for CORESET Note 3		24				
Number of transmitter antennas		1				
Duration of CORESET	symbols	2				
REG bundle size		6				
DMRS precoder granularity		Same as REG bundle size				
CCE to REG mapping		Interleaved				
Interleave n_shift		0				
Interleave size		2				
Beamforming Pre-Coder		N/A				
Aggregation level	CCE	8				
DCI formats		Note 1				
Payload size (without CRC)	bits	Note 2				

Note 1: DCI format shall depend upon the test configuration.

Note 2: Payload size shall depend upon the test configuration.

Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.

Table A.3.1.3.2-3: Control Channel RMC for TDD with SCS=120KHz

Parameter	Unit			Value		
Reference channel		CCR.3.1	CCR.3.2			
		TDD	TDD			
Channel bandwidth	MHz	100	100			
Subcarrier spacing	KHz	120	120			
Allocated resource blocks for CORESET Note 3		24	24			
Number of transmitter antennas		1	1			
monitoringSlotPeriodicityAndOffset		SI160	SI160			
		0	0			
monitoringSymbolsWithinSlot		1100000	0011000			
		0000000	0000000			
Duration of CORESET	slot	1	1			
REG bundle size		6	6			
		Same as	Same as			
DMRS precoder granularity		REG	REG			
Diviled precoder grandianty		bundle	bundle			
		size	size			
CCE to REG mapping		Interleaved	Interleaved			
Interleave n_shift		0	0			
Interleave size		2	2			
Beamforming Pre-Coder		N/A	N/A			
Aggregation level	CCE	8	8			
DCI formats		Note 1	Note 1			
Payload size (without CRC)	bits	Note 2	Note 2			

DCI format shall depend upon the test configuration. Note 1:

Note 2: Payload size shall depend upon the test configuration.

Allocated in the same resource blocks where the associated PDSCH RMC is scheduled. Note 3:

# A.3.1.4 TDD UL/DL configuration

Table A.3.1.4-1: TDD UL/DL configuration for SCS=15kHz

Parameter	Unit		Value
Reference channel		TDDConf.1.1	
referenceSubcarrierSpacing	kHz	15	
TDD UL/DL pattern 1 Note 2		'DSUU' S='10DL:2GP:2UL'	
dl-UL- TransmissionPeriodicity	ms	4	
nrofDownlinkSlots		1	
nrofDownlinkSymbols		10	
nrofUplinkSlot		2	
nrofUplinkSymbols		2	
TDD UL/DL pattern 2 Note 2		'D'	
dl-UL- TransmissionPeriodicity	ms	1	
nrofDownlinkSlots		1	
nrofDownlinkSymbols		0	
nrofUplinkSlot		0	
nrofUplinkSymbols		0	
Note 1: As specified in TS 38.213	[3] and TS 3	38.331 [2].	1

Note 2: For information

Table A.3.1.4-2: TDD UL/DL configuration for SCS=30kHz

Parameter	Unit		Value
Reference channel		TDDConf.2.1	
referenceSubcarrierSpacing	kHz	30	
TDD UL/DL pattern 1 Note 2		'3D1S4U'	
		S='6DL:4GP:4UL'	
dl-UL-	ms	4	
TransmissionPeriodicity			
nrofDownlinkSlots		3	
nrofDownlinkSymbols		6	
nrofUplinkSlot		4	
nrofUplinkSymbols		4	
TDD UL/DL pattern 2 Note 2		'DD'	
dl-UL-	ms	1	
TransmissionPeriodicity			
nrofDownlinkSlots		2	
nrofDownlinkSymbols		0	
nrofUplinkSlot		0	
nrofUplinkSymbols		0	
Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].			

For information Note 2:

Table A.3.1.4-3: TDD UL/DL configuration for SCS=120kHz

Parameter	Unit		Value
Reference channel		TDDConf.3.1	
referenceSubcarrierSpacing	kHz	120	
TDD UL/DL pattern 1 Note 2		'DDDSU'	
•		S='10DL:2GP:2UL'	
dl-UL-	ms	0.625	
TransmissionPeriodicity			
nrofDownlinkSlots		3	
nrofDownlinkSymbols		10	
nrofUplinkSlot		1	
nrofUplinkSymbols		2	
TDD UL/DL pattern 2 Note 2		Not configured	
dl-UL-	ms	Not configured	
TransmissionPeriodicity		_	
nrofDownlinkSlots		Not configured	
nrofDownlinkSymbols		Not configured	
nrofUplinkSlot		Not configured	
nrofUplinkSymbols		Not configured	
Note 1: As specified in TS 38.213	3 [3] and TS 3	38.331 [2].	

Note 2: For information

#### OFDMA channel noise generator (OCNG) A.3.2

# Generic OFDMA Channel Noise Generator (OCNG)

The OCNG pattern is used in a test for modelling allocations of unused resources in the channel bandwidth to virtual UEs (which are not under test). The OCNG pattern comprises PDCCH and PDSCH transmissions to the virtual UEs.

#### OCNG pattern 1: Generic OCNG pattern for all unused REs A.3.2.1.1

Table A.3.2.1.1-1: OP.1: Generic OCNG pattern for all unused REs

OCNG Parameters	Control Region	Data Region	
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)	
Channel	PDCCH	PDSCH	
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data	
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
Aggregation level Same as used in PDCCH RMC		N/A	
Code rate Same as used in PDCCH RMC		Same as used in PDSCH RMC	
Transmit Power Same as used in PDCCH RMC		Same as used in PDSCH RMC	
CP length Same as used in PDCCH RMC Same as used in PDSCH RMC		Same as used in PDSCH RMC	
Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.			
Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell.			

#### OCNG pattern 2: Generic OCNG pattern for all unused REs for 2AoA A.3.2.1.2 setup

Table A.3.2.1.2-2: OP.2: Generic OCNG pattern for all unused REs for 2AoA setup

OCNG Parameters	Control Region	Data Region	
Probe	Transmitting the serving beam		
Resource allocation	Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.	Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.	
Channel	PDCCH	PDSCH	
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data	
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
Aggregation level	Same as used in PDCCH RMC	N/A	
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC	
Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.			

REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the Note 2: channel bandwidth of the cell.

No OCNG is transmitted from the probe transmitting non-serving beam.

#### A.3.2.2 Void

# A.3.3 Reference DRX configurations

## A.3.3.1 DRX Configuration 1: DRX cycle = 40 ms and TAT = 500 ms

Table A.3.3.1-1: DRX.1: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	1 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
drx-LongCycleStartOffset	40 ms
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment	

Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]

## A.3.3.2 DRX Configuration 2: DRX cycle = 640 ms and TAT = 500 ms

Table A.3.3.2-1: DRX.2: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	1 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
drx-LongCycleStartOffset	640 ms
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignmen	

Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]

# A.3.3.3 DRX Configuration 3: DRX cycle = 40 ms and TAT = Infinity

Table A.3.3.3-1: DRX.3: DRX cycle = 40 ms and time alignment timer (TAT) = Infinity

Field	Value
drx-onDurationTimer	6 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
drx-LongCycleStartOffset	40 ms
shortDRX	disable
TimeAlignmentTimer	Infinity

Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]

# A.3.3.4 DRX Configuration 4: DRX cycle = 160 ms and TAT = Infinity

Table A.3.3.4-1: DRX.4: DRX cycle = 160 ms and time alignment timer (TAT) = Infinity

Field	Value	
drx-onDurationTimer	psf2	
drx-InactivityTimer	psf2	
drx-RetransmissionTimer	Psf16	
longDRX-CycleStartOffset	sf160, 0	
shortDRX	disable	
TimeAlignmentTimer	Infinity	
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see		
clause 6.3.2 in TS 36.331 [16].		

## A.3.3.5 DRX Configuration 5: DRX cycle = 320 ms and TAT = Infinity

Table A.3.3.5-1: DRX.5: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity

Field	Value
drx-onDurationTimer	psf6
drx-InactivityTimer	psf1920
drx-RetransmissionTimer	psf16
longDRX-CycleStartOffset	Sf320, 0
shortDRX	disable
TimeAlignmentTimer	Infinity
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see	
clause 6.3.2 in TS 36.331 [16].	

# A.3.3.6 DRX Configuration 6: DRX cycle = 320 ms and TAT = 500 ms

Table A.3.3.6-1: DRX.6: DRX cycle = 320 ms and time alignment timer (TAT) = 500 ms

Field	Value	
drx-onDurationTimer	1 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset	320 ms	
shortDRX	disable	
TimeAlignmentTimer	500 ms	
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment		
timer parameters are specified in clause 6.3.2 in TS 38.331 [2]		

#### DRX Configuration 7: DRX cycle = 640 ms and TAT = Infinity A.3.3.7

Table A.3.3.7-1: DRX.7: DRX cycle = 640 ms and time alignment timer (TAT) = Infinity

Field	Value	
drx-onDurationTimer	6 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset	640 ms	
shortDRX	disable	
TimeAlignmentTimer Infinity		
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]		

# DRX Configuration 8: DRX cycle = 320 ms and TAT = Infinity

Table A.3.3.8-1: DRX.8: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity

Field	Value	
drx-onDurationTimer	6 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset 320 ms		
shortDRX disable		
TimeAlignmentTimer Infinity		
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]		

# DRX Configuration 9: DRX cycle = 40 ms and TAT = 500 ms

Table A.3.3.9-1: DRX.9: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	psf2
drx-InactivityTimer	psf100
drx-RetransmissionTimer	psf16
longDRX-CycleStartOffset	Sf40, 0
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see	
clause 6.3.2 in TS 36.331 [16].	

## A.3.3.10 DRX Configuration 10: DRX cycle = 640 ms

Table A.3.3.10-1: DRX.10: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	psf6
drx-InactivityTimer	psf1920
drx-RetransmissionTimer	psf16
longDRX-CycleStartOffset	sf640, 0
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see	
clause 6.3.2 in TS 36.331 [16].	

## A.3.4 Test Cases with Different Channel Bandwidths

#### A.3.4.1 Test Cases with Different E-UTRA Channel Bandwidths

#### A.3.4.1.1 Introduction

In Annex A test cases involving E-UTRA cell(s) may be defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement.

#### A.3.4.1.2 Principle of testing

If multiple test cases involving E-UTRA cell(s) are defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement that is E-UTRA channel bandwidth independent, then the UE needs to be tested with only one channel bandwidth in each E-UTRA cell and with the same bandwidth in all the E-UTRA cells used in the test case.

# A.3.5 Test Cases for Synchronous and Asynchronous DC Operations

# A.3.5.1 EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations

#### A.3.5.1.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements for EN-DC operation in synchronous and asynchronous scenarios.

In Annex A test cases may be defined in both synchronous EN-DC and asynchronous EN-DC scenarios to verify the same type of RRM requirement.

#### A.3.5.1.2 Principle of Testing

If EN-DC test cases are defined in both synchronous and asynchronous EN-DC scenarios to verify the same type of RRM requirement then the UE capable of both synchronous and asynchronous EN-DC operations needs to be tested with one of the tests in either synchronous or asynchronous EN-DC scenarios.

# A.3.6 Antenna configurations

## A.3.6.1 Antenna configurations for FR1

Unless otherwise specified, NR FDD or NR TDD cells in all RRM Test cases in AWGN propagation condition are configured with Antenna Configuration 1x2.

#### A.3.6.1.1 Antenna connection for 4 Rx capable UEs

#### A.3.6.1.1.1 Introduction

All tests in section A.4 and A.6 are specified for UEs supporting 2RX. In this section, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in section A.4 or A.6 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

#### A.3.6.1.1.2 Principle of testing

#### A.3.6.1.1.2.1 Single carrier tests

For 4RX capable UEs supporting at least one 2RX band, the, all single carrier tests specified in section A.4 and A.6 except those in A.4.7 and A.6.7 shall be tested on any band where 2RX is supported with the antenna connection specified in A.6.3.1.2.4. For single carrier tests specified in section A.4.7 or A.6.7, all tests shall be tested with the antenna connection specified in A.3.6.1.1.2.4 for bands where 2RX is supported, and the antenna connection specified in A.3.6.1.1.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any 2RX band, all tests specified in sections A.4 and A.6 shall be tested using the antenna connection specified in section A.3.6.1.1.2.5. For radio link monitoring tests, the SNR levels are modified according to table A.3.6.1.1.2.1-1 and table A.3.6.1.1.2.1-2

Table A.3.6.1.1.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection

Test case	SNR during T3 (dB)			
	Test 1	Test 2	Test 3	Test 4
A.4.5.1.1	-18	N/A	N/A	N/A
A.4.5.1.3	-18	N/A	N/A	N/A
A.4.5.1.5	-18	N/A	N/A	N/A
A.4.5.1.7	-18	N/A	N/A	N/A
A.5.5.1.1	-18	N/A	N/A	N/A
A.5.5.1.3	-18	N/A	N/A	N/A
A.5.5.1.5	-18	N/A	N/A	N/A
A.5.5.1.7	-18	N/A	N/A	N/A
A.6.5.1.1	-18	N/A	N/A	N/A
A.6.5.1.3	-18	N/A	N/A	N/A
A.6.5.1.5	-18	N/A	N/A	N/A
A.6.5.1.7	-18	N/A	N/A	N/A
A.7.5.1.1	-18	N/A	N/A	N/A
A.7.5.1.3	-18	N/A	N/A	N/A
A.7.5.1.5	-18	N/A	N/A	N/A
A.7.5.1.7	-18	N/A	N/A	N/A

Table A.3.6.1.1.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection

Test case	SNR during T3 (dB)		SNR durin	g T4 (dB)
	Test 1	Test 2	Test 1	Test 2

A.4.5.1.2	-18	N/A	-8	N/A
A.4.5.1.4	-18	N/A	-8	N/A
A.4.5.1.6	-18	N/A	-8	N/A
A.4.5.1.8	-18	N/A	-8	N/A
A.5.5.1.2	-18	N/A	-8	N/A
A.5.5.1.4	-18	N/A	-8	N/A
A.5.5.1.6	-18	N/A	-8	N/A
A.5.5.1.8	-18	N/A	-8	N/A
A.6.5.1.2	-18	N/A	-8	N/A
A.6.5.1.4	-18	N/A	-8	N/A
A.6.5.1.6	-18	N/A	-8	N/A
A.6.5.1.8	-18	N/A	-8	N/A
A.7.5.1.2	-18	N/A	-8	N/A
A.7.5.1.4	-18	N/A	-8	N/A
A.7.5.1.6	-18	N/A	-8	N/A
A.7.5.1.8	-18	N/A	-8	N/A

#### A.3.6.1.1.2.2 Carrier aggregation tests

All carrier aggregation tests are performed using the antenna connection in section A.3.6.1.1.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6.1.1.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in section A.3.6.1.1.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

#### A.3.6.1.1.2.3 EN-DC tests

All carrier aggregation tests are performed using the antenna connection in section A.3.6.1.1.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6.1.1.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in section A.3.6.1.1.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

#### A.3.6.1.1.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaning 2 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

#### A.3.6.1.1.2.5 Antenna connection for bands where 4RX is supported

For bands where 4RX is supported, all 4 Rx are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring theresholds described in sections A.3.6.1.1.2.1 and A.3.6.1.1.2.2, no test parameters or requirements are modified.

#### A.3.6.1.1.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For bands where LTE 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaning 2 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

#### A.3.6.1.1.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For bands where LTE 4RX is supported, all 4 Rx are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the

modifications to radio link monitoring theresholds described in sections A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [15], no test parameters or requirements are modified.

## A.3.6.2 Antenna configurations for FR2

Unless otherwise specified, Downlink Antenna Configuration 2x2 for NR RRM FR2 requirements implies the following for the test configuration:

- The downlink signal is transmitted over the two polarizations (V and H) of the dual polarized antenna of the test equipment.
- The downlink signal is received assuming 2 UE baseband receivers. As the UE is tested following the Blackbox Approach with regard to the UE Rx antennas, the exact UE Rx antenna configuration is not relevant for the test configuration and has no impact on the test implementation.

# A.3.7 EN-DC test setup

#### A.3.7.1 Introduction

# A.3.7.2 E-UTRAN Serving Cell Parameters

#### A.3.7.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1

Table A.3.7.2.1-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with all NR cells in FR1. Unless otherwise stated within the test, all measurements in Annex A.4 and A.5 are performed only on the NR carrier. The E-UTRA PCell shall configured to not interfere with NR operation and the E-UTRA PCell signal power shall not be critical to the test purpose.

Table A.3.7.2.1-1: E-UTRAN cell specific test parameters for tests with all NR cells in FR1

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration <sup>Note1</sup>		6
TDD uplink-downlink configuration <sup>Note1</sup>		1
BW <sub>channel</sub>		5 MHz: N <sub>RB,c</sub> = 25
		10 MHz: N <sub>RB,c</sub> = 50
		20 MHz: N <sub>RB,c</sub> = 100
PDSCH parameters:		5 MHz: R.7 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.3 FDD
		20 MHz: R.6 FDD
		5 MHz: R.4 TDD
		10 MHz: R.0 TDD
		20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters:		5 MHz: R.11 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.6 FDD
		20 MHz: R.10 FDD
		5 MHz: R.11 TDD
		10 MHz: R.6 TDD
OON O. D. W. Note?		20 MHz: R.10 TDD
OCNG Patterns <sup>Note2</sup>		5 MHz: OP.20 FDD
		10 MHz: OP.10 FDD
		20 MHz: OP.17 FDD
		5 MHz: OP.9 TDD
		10 MHz: OP.1 TDD
DDCIL DA	4D	20 MHz: OP.7 TDD
PBCH_RA	dB	0

PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA <sup>Note3</sup>	dB	
OCNG_RB <sup>Note3</sup>	dB	
N <sub>oc</sub> Note4	dBm/15 kHz	-104
Ê <sub>s</sub> /N <sub>oc</sub>	dB	17
Ê <sub>s</sub> /I <sub>ot</sub>	dB	17
RSRP Note5	dBm/15 kHz	-87
SCH_RP Note5	dBm/15 kHz	-87
lo Note5	dBm/Ch BW	-59.13
		+10log
		(N <sub>RB,c</sub> /50)
Propagation Condition		AWGN
Antenna Configuration		1x2
Note 1: Special subframe and upl		ecified in table 4.2-1 in TS 36.211.

Note 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\text{oc}}$  to be

Note 5: Es/lot, RSRP, SCH\_RP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.3.7.2.2 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2

Table A.3.7.2.2-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with one or more NR cells in FR2.

Table A.3.7.2.2-1: E-UTRAN cell specific test parameters for tests with one or more NR cells in FR2

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration <sup>Note1</sup>		6
TDD uplink-downlink configuration <sup>Note1</sup>		1
BW <sub>channel</sub>	MHz	5 MHz: N <sub>RB,c</sub> = 25
		10 MHz: $N_{RB,c} = 50$
		20 MHz: N <sub>RB,c</sub> = 100
PDSCH parameters:		5 MHz: R.7 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.3 FDD
		20 MHz: R.6 FDD
		5 MHz: R.4 TDD
		10 MHz: R.0 TDD
		20 MHz: R.3 TDD

PCFICH/PDCCH/PHICH parameters:		5 MHz: R.11 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.6 FDD
		20 MHz: R.10 FDD
		5 MHz: R.11 TDD
		10 MHz: R.6 TDD
		20 MHz: R.10 TDD
OCNG Patterns <sup>Note2</sup>		5 MHz: OP.20 FDD
		10 MHz: OP.10 FDD
		20 MHz: OP.17 FDD
		5 MHz: OP.9 TDD
		10 MHz: OP.1 TDD
		20 MHz: OP.7 TDD
PBCH_RA	dB	
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	0
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA <sup>Note3</sup>	dB	
OCNG_RB <sup>Note3</sup>	dB	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
 Note 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
 Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
 Note 4: The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation.

The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation. The Test System shall provide a stable and noise-free E-UTRA signal without need of precise propagation modelling, path loss and polarization control. Further details of the E-UTRA signal configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not under performance verification and is not expected to influence the NR FR2 requirement.

# A.3.8 PRACH configurations

### A.3.8.1 Introduction

This section provides the typical PRACH configurations used for RRM test cases defined in Annex A. To note that for other parameters not listed in this section, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

# A.3.8.2 PRACH configurations in FR1

#### A.3.8.2.1 FR1 PRACH configuration 1

FR1 PRACH configuration 1 in this section provides the typical PRACH configuration for SSB-based contention based random access in FR1.

Table A.3.8.2.1-1: Parameters for FR1 PRACH configuration 1

Field	Value	Comment	
prach-ConfigurationIndex	87	160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].	
msg1-SubcarrierSpacing	Same as UL carrier SCS		
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random acces	
numberOfRA-PreamblesGroupA	48	No group B.	
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root sequence = 1.	
ssb-perRACH-OccasionAndCB- PreamblesPerSSB	oneFourth, n48	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB	
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.	
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].	
ra-ContentionResolutionTimer	sf48	48 sub-frames	
powerRampingStep	dB2		
preambleReceivedTargetPower	dBm-120		
preambleTransMax	n6	Max number of RA preamble transmission perfomed before declaring a failure is 6	
ra-ResponseWindow	sl10	10 slots	
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23	
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].	
Note: For further information see clause 6.3.2 in TS 38.331 [2].			

## A.3.8.2.2 FR1 PRACH configuration 2

FR1 PRACH configuration 2 in this section provides the typical PRACH configuration for SSB based non-contention based random access in FR1.

Table A.3.8.2.2-1: Parameters for FR1 PRACH configuration 2

Field	Value	Comment	
prach-ConfigurationIndex	87	160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].	
msg1-SubcarrierSpacing	Same as UL carrier SCS		
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random acces	
numberOfRA-PreamblesGroupA	48	No group B.	
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root sequence = 1.	
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions	
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.	
powerRampingStep	dB2		
preambleReceivedTargetPower	dBm-120		
preambleTransMax	n6	Max number of RA preamble transmission perfored before declaring a failure is 6	
ra-ResponseWindow	sl10	10 slots	
zeroCorrelationZoneConfig	11	N-CS configuration, Ncs = 23	
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].	
ssb-ResourceList	ra-PreambleIndex = 50	Assocated with SSB index 0	
ra-ssb-OccasionMaskIndex	1	PRACH occasion index 1 is allowed	
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].	
Note: For further information see clause 6.3.2 in TS 38.331 [2].			

# A.3.8.2.3 FR1 PRACH configuration 3

FR1 PRACH configuration 3 in this section provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR1.

Table A.3.8.2.3-1: Parameters for FR1 PRACH configuration 3

Field	Value	Comment	
prach-ConfigurationIndex	87	160ms PRACH periodicity, and other	
		detailed configuration defined in table	
		6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211	
		[6].	
msg1-SubcarrierSpacing	Same as UL carrier SCS		
totalNumberOfRA-Preambles	48	Total number of preambles used for	
		contention based and contention free	
		random acces	
numberOfRA-PreamblesGroupA	48	No group B.	
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root	
		sequence = 1.	
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH	
		occasions	
msg1-FDM	One	One PRACH transmission occasions	
		FDMed in one time instance.	
powerRampingStep	dB2		
preambleReceivedTargetPower	dBm-120		
preambleTransMax	n6	Max number of RA preamble transmission	
		perfomed before declaring a failure is 6	
ra-ResponseWindow	sl10	10 slots	
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23	
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321	
		[7].	
csirs-ResourceList	ra-PreambleIndex = 50	Assocated with CSI-RS configured	
ra-OccasionList	1	RA occasions allowed corresponding to	
		CSI-RS	
rsrp-ThresholdCSI-RS	RSRP_51	The actual value of the threshold is -	
		105dBm, as defined in TS 38.331 [2].	
Note: For further information see clause 6.3.2 in TS 38.331 [2].			

# A.3.8.2.4 FR1 PRACH configuration 4

FR1 PRACH configuration 4 in this section provides the PRACH configuration for CSI-RS based non-contention based random access in FR1 to convey BFR.

Table A.3.8.2.4-1: Parameters for FR1 PRACH configuration 4

Field	Value	Comment
prach-ConfigurationIndex	0	160ms PRACH periodicity, and other
		detailed configuration defined in table
		6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211
		[6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for
		contention based and contention free
		random acces
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root
		sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH
		occasions
msg1-FDM	One	One PRACH transmission occasions
		FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n200	Max number of RA preamble transmission
		perfomed before declaring a failure is 200
ra-ResponseWindow	sl1	1 slot
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 93
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in
		TS 38.321 [7].
BFR-CSIRS-Resource	ra-PreambleIndex = 50	Assocated with CSI-RS configured
ra-OccasionList	1	RA occasions allowed corresponding to CSI-RSh
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is -
		105dBm, as defined in TS 38.331 [2].
Note: For further information se	ee clause 6.3.2 in TS 38.331 [2	].

# A.3.8.3 PRACH configurations in FR2

# A.3.8.3.1 FR2 PRACH configuration 1

FR2 PRACH configuration 1 in this section provides the typical PRACH configuration for SSB-based contention based random access in FR2.

Table A.3.8.3.1-1: Parameters for FR2 PRACH configuration 1

Field	Value	Comment		
prach-ConfigurationIndex	173	Preamble Format C2, with 160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].		
msg1-SubcarrierSpacing	Same as UL carrier SCS			
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random acces		
numberOfRA-PreamblesGroupA	48	No group B.		
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root sequence = 1.		
ssb-perRACH-OccasionAndCB- PreamblesPerSSB	oneFourth, n48	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB		
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.		
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].		
ra-ContentionResolutionTimer	sf48	48 sub-frames		
powerRampingStep	dB2			
preambleReceivedTargetPower	dBm-120			
preambleTransMax	n6	Max number of RA preamble transmission perfomed before declaring a failure is 6		
ra-ResponseWindow	sl10	10 slots		
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23		
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS 38.321 [7].		
Note: For further information see clause 6.3.2 in TS 38.331 [2].				

## A.3.8.3.2 FR2 PRACH configuration 2

FR2 PRACH configuration 2 in this section provides the typical PRACH configuration for SSB based non-contention based random access in FR2.

Table A.3.8.3.2-1: Parameters for FR2 PRACH configuration 2

Field	Value	Comment
prach-ConfigurationIndex	173	Preamble Format C2, with 160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random acces
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n6	Max number of RA preamble transmission perfored before declaring a failure is 6
ra-ResponseWindow	sl10	10 slots
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS 38.321 [7].
ssb-ResourceList	ra-PreambleIndex = 50	Assocated with SSB index 0
ra-ssb-OccasionMaskIndex	1	PRACH occasion index 1 is allowed
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].
Note: For further information se	ee clause 6.3.2 in TS 38.331 [2]	].

# A.3.8.3.3 FR2 PRACH configuration 3

FR2 PRACH configuration 3 in this section provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR2.

Field	Value	Comment
prach-ConfigurationIndex	173	Preamble Format C2, with 160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random acces
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n6	Max number of RA preamble transmission perfomed before declaring a failure is 6
ra-ResponseWindow	sl10	10 slots
zeroCorrelationZoneConfig	11	N-CS configuration, Ncs = 23
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS 38.321 [7].
csirs-ResourceList	ra-PreambleIndex = 50	Assocated with CSI-RS configured
ra-OccasionList	1	RA occasions allowed corresponding to CSI-RS
rsrp-ThresholdCSI-RS	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].
Note: For further information se	ee clause 6.3.2 in TS 38.331 [2]	].

## A.3.8.3.4 FR2 PRACH configuration 4

FR2 PRACH configuration 4 in this section provides the PRACH configuration for CSI-RS based non-contention based random access in FR2 to convey BFR.

Field	Value	Comment
prach-ConfigurationIndex	144	Preamble Format C0, with 160ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random acces
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic equence index = 0, resulting in root sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n200	Max number of RA preamble transmission perfored before declaring a failure is 200.
ra-ResponseWindow	sl40	40 slots
zeroCorrelationZoneConfig	11	N-CS configuration, Ncs = 23
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS 38.321 [7].
BFR-CSIRS-Resource	ra-PreambleIndex = 50	Assocated with CSI-RS configured
ra-OccasionList	1	RA occasions allowed corresponding to CSI-RS
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].
Note: For further information se	ee clause 6.3.2 in TS 38.331 [2]	].

# A.3.9 BWP configurations

### A.3.9.1 Introduction

This section provides the typical BWP configurations used for RRM test cases defined in Annex A. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in section A.3.9.2 and for uplink BWP, both initial BWP and dedicated BWP configurations are specified in section A.3.9.3. To note that for other parameters not listed in this section, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

# A.3.9.2 Downlink BWP configurations

### A.3.9.2.1 Initial BWP

Table A.3.9.2.1-1: Downlink BWP patterns for initial BWP configuration

BWP Parameters	Unit		Values	
Reference BWP		DLBWP.0.1	DLBWP.0.2	
Starting PRB index		0	RBa Note 1	
Bandwidth	RB	Same as RF channel defined in each test	same as RMSI CORSET(CORSE T #0) defined in each test	
Note 1: RB₂ is the lowest PRB index to guarantee the BWP including SSB PRB index				
(RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) which is defined in Section A.3.10.				

### A.3.9.2.2 Dedicated BWP

Table A.3.9.2.2-1: Downlink BWP patterns for dedicated BWP configuration

BWP Parameters Unit			Values		
Reference BWP			DLBWP.1.1	DLBWP.1.2	DLBWP.1.3
Starting PF	RB index		0	RB <sub>b</sub> Note 1	RBa Note 2
Bandwidth		RB	Same as RF channel defined in each test	25 for SCS = 15KHz, 51 for SCS = 30KHz, 32 for SCS = 120KHz	25 for SCS = 15KHz, 51 for SCS = 30KHz, 32 for SCS = 120KHz
	, , , , , , , , , , , , , , , , , , , ,				
		index (RBJ, RBJ+1,, RBJ+19) which is defined in Section A.3.10.			
Note 2:		a is the lowest PRB index to guarantee the BWP including SSB PRB index BJ, RBJ+1,, RBJ+19) which is defined in Section A.3.10.		SSB PRB Index	

# A.3.9.3 Uplink BWP configurations

### A.3.9.3.1 Initial BWP

Table A.3.9.3.1-1: Uplink BWP patterns for initial BWP configuration

BWP Parameters	Unit		Values	
Reference BWP		ULBWP.0.1	ULBWP.0.2	
Starting PRB index		0	RBa Note 1	
Bandwidth	RB	Same as RF channel defined in each test	same as RMSI CORSET(CORSET #0) defined in each test	
Note 1: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index				
(RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) which is defined in Section A.3.10.				

### A.3.9.3.2 Dedicated BWP

Table A.3.9.3.2-1: Uplink BWP patterns for dedicated BWP configuration

BWP Parameters	Unit		Values	
Reference BWP		ULBWP.1.1	ULBWP.1.2	ULBWP.1.3
Starting PRB index		0	RB <sub>b</sub> Note 1	RBa Note 2
Bandwidth	RB	Same as RF channel defined in each test	25 for SCS = 15KHz, 51 for SCS = 30KHz, 32 for SCS = 120KHz	25 for SCS = 15KHz, 51 for SCS = 30KHz, 32 for SCS = 120KHz
	* · · · · · · · · · · · · · · · · · · ·			
		(RBJ, RBJ+1,, RBJ+19) which is defined in Section A.3.10.		
			SSB PKB Index	
(RB <sub>J</sub> , RB <sub>J</sub>	+1,, RI	B <sub>J+19</sub> ) which is define	d in Section A.3.10.	

# A.3.10 SSB Configurations

# A.3.10.1 SSB Configurations for FR1

A.3.10.1.1 SSB pattern 1 in FR1: SSB for SSB SCS=15 KHz in 10 MHz

Table A.3.10.1.1-1: SSB.1 FR1: SSB Pattern 1 for SSB SCS=15 KHz in 10 MHz channel

SSB Parameters	Values	
Channel bandwidth	10 MHz	
SSB SCS	15 KHz	
SSB periodicity	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Indices of symbols containing SSB	2-5	
Indices of slots containing SSB	0	
RB numbers containing SSB within channel BW	(RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) <sup>Note 1</sup>	
Note 1: RBs containing SSB can be configured in any frequency location within the ce		
bandwidth according to the allowed synchron	zation raster defined in TS	
38.104 [13].		

### A.3.10.1.2 SSB pattern 2 in FR1: SSB allocation for SSB SCS=30 KHz in 40 MHz

Table A.3.10.1.2-1: SSB.2 FR1: SSB Pattern 2 for SSB SCS=30 KHz in 40 MHz channel

	SSB Parameters	Values
Channel bandwidth		40 MHz
SSB SCS	3	30 KHz
SSB peri	odicity	20 ms
Number	of SSBs per SS-burst	1
SS/PBCI	H block index	0
Indices o	f symbols containing SSB	4-7 or 2-5 Note 2
Indices o	f of slots containing SSB	0
RB numb	pers containing SSB within channel BW	(RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) <sup>Note 1</sup>
Note 1: Note 2:	RBs containing SSB can be configured in an bandwidth according to the allowed synchro TS 38.104 [13].  Symbols 4-7 is chosen, if the SSB pattern C band as indicated by Table 5.4.3.3-1 of TS 3 chosen.	nization raster defined in ase B should be used for the current

### A.3.10.1.3 SSB pattern 3 in FR1: SSB for SSB SCS=15 KHz in 10 MHz

Table A.3.10.1.3-1: SSB.3 FR1: SSB Pattern 3 for SSB SCS=15 KHz in 10 MHz channel

	SSB Parameters	Va	lues
Channel	bandwidth	10 MHz	
SSB SCS	5	15 KHz	
SSB peri	odicity	20 ms	
Number	of SSBs per SS-burst	2	
	H block index	0	1
Symbol r	numbers of symbols containing SSB	2-5	8-11
RB numb	RB numbers containing SSB within channel BW		, RB <sub>J+19</sub> ) <sup>Note 1</sup>
Note 1: RBs containing SSB can be configured in any frequence			on within the cell
	bandwidth according to the allowed synchroniz	zation raster defir	ned in
	TS 38.104 [13].		

### A.3.10.1.4 SSB pattern 4 in FR1: SSB allocation for SSB SCS=30 KHz in 40 MHz

Table A.3.10.1.4-1: SSB.4 FR1: SSB Pattern 4 for SSB SCS=30 KHz in 40 MHz channel

	SSB Parameters		ues
Channel bandwidth		40 MHz	
SSB SC	3	30 KHz	
SSB peri	odicity	20 ms	
Number	of SSBs per SS-burst	2	
SS/PBCI	H block index	0	1
Symbol r	numbers of symbols containing SSB	4-7 or 2-5 Note 2	8-11
RB numb	pers containing SSB within channel BW	(RBJ, RBJ+1,, RBJ+19)Note 1	
Note 1: RBs containing SSB can be configured in any frequency location within the containing state of bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].			
Note 2:	Symbols 4-7 is chosen, if the SSB pattern Case band as indicated by Table 5.4.3.3-1 of TS 38. chosen.		

# A.3.10.2 SSB Configurations for FR2

### A.3.10.2.1 SSB pattern 1 in FR2: SSB allocation for SSB SCS=120 KHz in 100 MHz

Table A.3.10.2.1-1: SSB.1 FR2: SSB Pattern 1 for SSB SCS = 120 KHz in 100 MHz channel with 2 SSBs per SS-burst

SSB Parameters	Values		
Channel bandwidth	100 MHz		
SSB SCS	120 KHz		
SSB periodicity	20 ms		
Number of SSBs per SS-burst	2	2	
SS/PBCH block index	0	1	
Indices of symbols containing SSBs	4-7	8-11	
Indices of slots containing SSB	0	0	
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19)Note 1			
Note 1: RBs containing SSB can be configured in any frequency location within the cell			
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].			

### A.3.10.2.2 SSB pattern 2 in FR2: SSB allocation for SSB SCS=240 KHz in 100 MHz

Table A.3.10.2.2-1: SSB.2 FR2: SSB Pattern 2 for SSB SCS = 240 KHz in 100 MHz channel with 2 SSBs per SS-burst

SSB Parameters		Values		
Channel bandwidth	100 MHz			
SSB SCS	240 KHz			
SSB periodicity	20 ms	20 ms		
Number of SSBs per SS-burst	2	2		
SS/PBCH block index	0	1		
Indices of symbols containing SSBs	8-11	8-11 12-13, 0-1		
Indices of slots containing SSB	0 0, 1			
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19)Note 1				
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].				

### A.3.10.2.3 SSB pattern 3 in FR2: SSB allocation for SSB SCS=120 KHz in 100 MHz

Table A.3.10.2.3-1: SSB.3 FR2: SSB Pattern 3 for SSB SCS = 120 KHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	120 KHz	
SSB periodicity	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Indices of symbols containing SSBs 4-7		
Indices of slots containing SSB 0		
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19)Note 1		
Note 1: RBs containing SSB can be configured in any frequency location within the cell		
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		

## A.3.10.2.4 SSB pattern 4 in FR2: SSB allocation for SSB SCS=240 KHz in 100 MHz

Table A.3.10.2.4-1: SSB.4 FR2: SSB Pattern 4 for SSB SCS = 240 KHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	240 KHz	
SSB periodicity	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Indices of symbols containing SSBs	8-11	
Indices of slots containing SSB	0	
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19)Not		
Note 1: RBs containing SSB can be configured in any frequency location within the cell		
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		

### A.3.10.2.5 SSB pattern 5 in FR2: SSB allocation for SSB SCS=120 KHz in 100 MHz

Table A.3.10.2.5-1: SSB.5 FR2: SSB Pattern 5 for SSB SCS = 120 KHz in 100 MHz channel with 2 SSBs per SS-burst

SSB Parameters	Values			
Channel bandwidth	100 MHz	100 MHz		
SSB SCS	120 KHz			
SSB periodicity	20 ms	20 ms		
Number of SSBs per SS-burst	2	2		
SS/PBCH block index	2	3		
Indices of symbols containing SSBs	2-5	6-9		
Indices of slots containing SSB	1	1 1		
RB numbers containing SSBs within channel BW (RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) <sup>Note 1</sup>				
Note 1: RBs containing SSB can be configured in any frequency location within the cell				
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].				

### A.3.10.2.6 SSB pattern 6 in FR2: SSB allocation for SSB SCS=240 KHz in 100 MHz

Table A.3.10.2.6-1: SSB.6 FR2: SSB Pattern 6 for SSB SCS = 240 KHz in 100 MHz channel with 2 SSBs per SS-burst

SSB Parameters	Values			
Channel bandwidth	100 MHz			
SSB SCS	240 KHz			
SSB periodicity	20 ms			
Number of SSBs per SS-burst	2	2		
SS/PBCH block index	2	3		
Indices of symbols containing SSBs	ols containing SSBs 2-5 6-9			
Indices of slots containing SSB	of slots containing SSB 1 1			
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19)Note 1				
Note 1: RBs containing SSB can be configured in any frequency location within the cell				
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].				

### A.3.10.2.7 SSB pattern 7 in FR2: SSB allocation for SSB SCS=120 KHz in 100 MHz

Table A.3.10.2.7-1: SSB.7 FR2: SSB Pattern 7 for SSB SCS = 120 KHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	120 KHz	
SSB periodicity	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	1	
Indices of symbols containing SSBs	8-11	
Indices of slots containing SSB 0		
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19)Note		
Note 1: RBs containing SSB can be configured in any frequency location within the cell		
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		

### A.3.10.2.8 SSB pattern 8 in FR2: SSB allocation for SSB SCS=240 KHz in 100 MHz

Table A.3.10.2.8-1: SSB.8 FR2: SSB Pattern 8 for SSB SCS = 240 KHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	240 KHz	
SSB periodicity	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	1	
Indices of symbols containing SSBs	12-13, 0-1	
Indices of slots containing SSB	0, 1	
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19) <sup>Note</sup>		
Note 1: RBs containing SSB can be configured in any frequency location within the cell		
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		

# A.3.11 SMTC Configurations

# A.3.11.1 SMTC pattern 1: SMTC period = 20 ms with SMTC duration = 1 ms

Table A.3.11.1-1: SMTC.1: SMTC Pattern 1 for SMTC period = 20 ms and duration = 1 ms

SMTC Parameters	Values	
SMTC periodicity	20 ms	
SMTC offset	0 ms	
SMTC duration	1 ms	

# A.3.11.2 SMTC pattern 2: SMTC period = 20 ms with SMTC duration = 5 ms

Table A.3.11.2-1: SMTC.2: SMTC Pattern 2 for SMTC period = 20 ms and duration = 5 ms

SMTC Parameters	Values
SMTC periodicity	20 ms
SMTC offset	0 ms
SMTC duration	5 ms

# A.3.11.3 SMTC pattern 3: SMTC period = 160 ms with SMTC duration = 1 ms

Table A.3.11.3-1: SMTC.3: SMTC Pattern 3 for SMTC period = 20 ms and duration = 5 ms

SMTC Parameters	Values
SMTC periodicity	160 ms
SMTC offset	0 ms
SMTC duration	1 ms

# A.3.12 Test Cases with Different CC Configurations

# A.3.12.1 EN-DC Test Cases with Different EN-DC Configurations

#### A.3.12.1.1 Introduction

In Annex A EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

#### A.3.12.1.2 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

Editor's: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.

## A.3.12.2 Carrier Aggregation Test Cases with Different CA Configurations

### A.3.12.2.1 Introduction

In Annex A carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

### A.3.12.2.2 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then

from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

Editor's: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.

# A.3.13 Test Cases in SA and EN-DC Operations

### A.3.13.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements in standalone (SA) or EN-DC operations.

In Annex A test cases may be defined in SA and EN-DC operations to verify the same RRM requirement.

Editor's note: this section may need to define further for NE-DC and NR-DC test cases, which subjects to the test cases defined in the future.

### A.3.13.2 Principle of Testing

If test cases are defined in both SA and EN-DC operations to verify the same RRM requirement then the UE capable of both SA and EN-DC operations needs to verify that RRM requirement by performing test case(s) in either SA operation or in EN-DC operation.

If test cases are defined in both SA and EN-DC operations to verify at least one common RRM requirement then the UE capable of both SA and EN-DC operations needs to verify RRM requirements by performing test case(s) in either SA operation or in EN-DC operation provided that the performed test case(s):

- verifies the largest number of RRM requirements and
- verifies at least all RRM requirements covered in the test case(s), which is not performed.

# A.3.14 CSI-RS configurations

#### A.3.14.1 FDD

Table A.3.14.1-1: CSI-RS Reference Measurement Channels for SCS=15kHz

	CSI-RS.1.1 FDD	CSI-RS.1.2 FDD	CSI-RS.1.3 FDD	CSI-RS.1.4 FDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				
nzp-CSI-RS-ResourceId	0 for resource #0	10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2 33 for resource #3
	11 for resource	11 for resource #1	21 for resource #1	34 for resource #4

			1	25 60"
				35 for resource #5
				36 for
				resource #6
				37 for
				resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	TBD	slot10	n.a.	n.a.
Offset	TBD	1	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0	n.a.	n.a.
qci-inioPeriodicCSi-RS	TOI.State.0	TCI.State.1	II.a.	II.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
			6 for resource #0	0 for resource
				#0
				1 for resource
		6 for resource #0		#1
				2 for resource
				#2
				3 for resource
firstOFDMSymbolInTimeDomain	5 for resource #0			#3
				4 for resource #4
				5 for resource
				#5
		10 for resource #1	10 for resource #1	6 for resource
				#6
				7 for resource
				#7
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

# A.3.14.2 TDD

Table A.3.14.2-1: CSI-RS Reference Measurement Channels for SCS=15kHz

	CSI-RS.1.1 TDD	CSI-RS.1.2 TDD	CSI-RS.1.3 TDD	CSI-RS.1.4 TDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				
		10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2 33 for resource #3
nzp-CSI-RS-ResourceId	0 for resource #0	11 for resource #1	21 for resource #1	34 for resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	TBD	slot10	n.a.	n.a.
Offset	TBD	1	n.a.	n.a.
Onset	100	TCI.State.0	ii.a.	ii.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
	o for resource #0	10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

Table A.3.14.2-2: CSI-RS Reference Measurement Channels for SCS=30kHz

	CSI-RS.2.1 TDD	CSI-RS.2.2 TDD	CSI-RS.2.3 TDD	CSI-RS.2.4 TDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				30 for resource #0 31 for
nzp-CSI-RS-ResourceId	0 for resource #0	10 for resource #0	20 for resource #0	resource #1 32 for resource #2 33 for resource #3
	o for reasource no	11 for resource #1	21 for resource #1	34 for resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	TBD	slot20	n.a.	n.a.
Offset	TBD	2	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
	10 for resource		10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

Table A.3.14.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz

	CSI-RS.3.1 TDD	CSI-RS.3.2 TDD	CSI-RS.3.3 TDD	CSI-RS.3.4 TDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				00.1
nzp-CSI-RS-ResourceId	0 for resource #0	10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2 33 for resource #3
nizp con no nessariona	o for reasonice we	11 for resource #1	21 for resource #1	34 for resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	TBD	slot80	n.a.	n.a.
Offset	TBD	8	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
nistor bivioymbolii i ililebolii alii	o for resource #0	10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

# A.3.15 Angle of Arrival (AoA) for FR2 RRM test cases

This clause specifies the AoA setups for FR2 RRM test cases in section A.5 and A.7. The applicable AoA setup is defined in each test case in section A.5 and A.7.

### A.3.15.1 Setup 1: Single AoA in Rx beam peak direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, are aligned to the UE Rx beam peak direction (as defined in TS 38.101-2 [19]).

### A.3.15.2 Setup 2: Single AoA in non Rx beam peak direction

# A.3.15.2.1 Setup 2a: Single AoA in non Rx beam peak direction without change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the signals shall not be changed between test iterations.

# A.3.15.2.2 Setup 2b: Single AoA in non Rx beam peak direction with change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. For UE power class 3, the direction (AoA) of the signals shall be changed for each test iteration (for UE power classes other than 3, this is FFS).

### A.3.15.3 Setup 3: 2 AoAs

There are 2 active probes in the test. The DL signals, and noise if applicable, transmitted from the two active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The relative angular offset between the directions (AoAs) of the 2 active probes, shall be changed for each test iteration. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

Editor Note: If RAN5 finds the changing of angular offset between the directions (AoAs) of the 2 active probes per test iteration to be infeasible from the perspectives of EIS spherical coverage and other impacts, e.g.: testing time, then the test setup will be revised.

Table 3.15.3-1: Set of relative anguler offsets between active probes for each power class

UE Power class	Relative angular offset between active probes
1	FFS
2	FFS
3	30°, 60°, 90°, 120° and 150°
4	FFS

# A.3.16 TCI State Configuration

### A.3.16.1 Introduction

This section provides the configurations for TCI states towards either SSB or CSI-RS. The TCI states defined in this section are configured in each test when applicable to indicate that certain DL signals are QCL'ed with the referenceSignal configured in the TCI states.

### A.3.16.2 TCI states

Table A.3.16.2-1: TCI States

Parameter	TCI.State.0	TCI.State.1	TCI.State.2	TCI.State.3
tci-StateId	ld0	ld1	ld2	ld3
qcl-Type1	typeC	typeC	typeA	typeA
qcl-Type2Note1	typeD	typeD	typeD	typeD
referenceSignal	SSB0	SSB1	TRS.2.1 TDD	TBD

Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2

Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a testspecific manner.

Table A.3.16.2-2: Void

# A.3.17 Configurations of CSI-RS for tracking

# A.3.17.1 Configuration of CSI-RS for tracking for FR1

#### A.3.17.1.1 FDD

Table A.3.17.1.1-1: CSI-RS for tracking for SCS=15kHz

Parameter	Unit	Value
Reference channel		TRS.1.1 FDD
Bandwidth		BW of Active BWP <sup>Note</sup>
SCS	kHz	15
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the PRB used for		I <sub>0</sub> = 6 for CSI-RS resource 1 and 3
CSI-RS		I <sub>0</sub> = 10 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	20 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	10 for CSI-RS resource 1 and 2
CSI-RS Offset	SIUIS	11 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	-3
Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases		

Table A.3.17.1.1-2: CSI-RS for tracking for SCS=30kHz

Parameter	Unit	Value
Reference channel		TRS.1.2 FDD
Bandwidth		BW of Active BWP <sup>Note</sup>
SCS	kHz	30
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the PRB used for		l <sub>0</sub> = 6 for CSI-RS resource 1 and 3
CSI-RS		I <sub>0</sub> = 10 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	40 for CSI-RS resource 1,2,3,4
CSI-RS offset	alata	20 for CSI-RS resource 1 and 2
CSI-RS offset	slots	21 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	-3
Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases		

### A.3.17.1.2 TDD

Table A.3.17.1.2-1: CSI-RS for tracking for SCS=15kHz

Parameter	Unit	Value
Reference channel		TRS.1.1 TDD
Bandwidth		BW of Active BWP <sup>Note</sup>
SCS	kHz	15
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the PRB used for		I <sub>0</sub> = 6 for CSI-RS resource 1 and 3
CSI-RS		I <sub>0</sub> = 10 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	20 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	10 for CSI-RS resource 1 and 2 11 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	-3
Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases		

Table A.3.17.1.2-2: CSI-RS for tracking for SCS=30kHz

Parameter	Unit	Value
Reference channel		TRS.1.2 TDD
Bandwidth		BW of Active BWP <sup>Note</sup>
SCS	kHz	30
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the PRB used for		l <sub>0</sub> = 6 for CSI-RS resource 1 and 3
CSI-RS		I <sub>0</sub> = 10 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	40 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	20 for CSI-RS resource 1 and 2
C3I-R3 Oliset	SIOIS	21 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	-3
Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases		

# A.3.17.2 Configuration of CSI-RS for tracking for FR2

### A.3.17.2.1 TDD

Table A.3.17.2.1-1: CSI-RS for tracking for SCS=120kHz Set 1

Parameter	Unit	Value
Reference channel		TRS.2.1 TDD
Bandwidth		BW of Active BWP <sup>Note</sup>
SCS	kHz	120
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the PRB used for		l <sub>0</sub> = 1 for CSI-RS resource 1 and 3
CSI-RS		I <sub>0</sub> = 5 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	80 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	40 for CSI-RS resource 1 and 2 41 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	-3
TCI state		TCI.State.0
Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases		

Table A.3.17.2.1-2: CSI-RS for tracking for SCS=120kHz Set 2

Parameter	Unit	Value
Reference channel		TRS.2.2 TDD
Bandwidth		BW of Active BWP <sup>Note</sup>
SCS	kHz	120
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the PRB used for		I <sub>0</sub> = 2 for CSI-RS resource 1 and 3
CSI-RS		I <sub>0</sub> = 6 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	80 for CSI-RS resource 1,2,3,4
CSI-RS offset	alata	40 for CSI-RS resource 1 and 2
CSI-RS offset	slots	41 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	-3
TCI state		TCI.State.1
Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases		

# A.4 EN-DC tests with all NR cells in FR1

A.4.1 Void

A.4.2 Void

# A.4.3 RRC\_CONNECTED state mobility

A.4.3.1 Void

# A.4.3.2 RRC Connection Mobility Control

A.4.3.2.1 Void

A.4.3.2.2 Random Access

#### A.4.3.2.2.1 Contention based random access test in FR1 for PSCell in EN-DC

#### A.4.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in section A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.1.1-1. UE capble of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.1.1-2.

Table A.4.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for PSCell in EN-DC

(	Config	Description	
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
	2	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
	4	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
Note:	The UE is only re capability	equired to be tested in one of the supported test configurations depending on UE	

Table A.4.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for PSCell in EN-DC

Parameter		Unit	Test-1	Comments	
SSB Configu	ration	Config 1,2 Config 3,4	-	SSB pattern 1 in FR1 SSB pattern 2 in FR1	As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below
Number of S	SBs per SS	-burst		2	Different from the definition in A.3.10
SS/PBCH ble	ock index			0,1	Different from the definition in A.3.10
Duplex Mode	e for Cell 2	Config 1,2		FDD	
•		Config 3,4		TDD	
TDD Configu		Config 3,4		TDDConf.1.2	
OCNG Patte				OCNG pattern 1	As defined in A.3.2.1.
PDSCH para	meters	Config 1,2		SR.1.1 FDD	As defined in A.3.1.1.
Note 4		Config 3,4	1	SR.2.1 TDD	
NR RF Char	nel Numbe	r		1	
EPRE ratio of	of PSS to SS	SS	dB		
EPRE ratio of	of PBCH_DI	MRS to SSS	dB		
EPRE ratio o	f PBCH to I	PBCH_DMRS	dB		
EPRE ratio of	of PDCCH_I	DMRS to SSS	dB	0	
EPRE ratio of	of PDCCH to	PDCCH_DMRS	dB		
		DMRS to SSS	dB		
EPRE ratio of	of PDSCH to	PDSCH_DMRS	dB		
SSB with	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index  0 is setto be above
index 0	$N_{oc}$	Config 1,2	dBm/15kHz	-98	configured rsrp-
	00	Config 3,4		-101	ThresholdSSB
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSR	P Note 3	dBm/ SCS	-95	
SSB with	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index  1 is set to be below
index 1	$N_{oc}$	Config 1,2	dBm/15kHz	-98	configured rsrp-
	oc	Config 3,4		-101	ThresholdSSB
	$\hat{E}_s/N_{oc}$	•	dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
lo Note 2	•	Config 1,2	dBm	-65.3/9.36MHz	For symbols without SSB
10 2		Config 3,4	]	-62.2/38.16MHz	index 1
ss-PBCH-Blo	ockPower	•	dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [2].

Configured UE transmitted power ( $P_{ m CMAX,f.c.}$ )	dBm	23	As defined in clause 6.2.4 in TS 38.101-1.			
PRACH Configuration		FR1 PRACH configuration 1	As defined in A.3.8.2.			
Propagation Condition	-	AWGN				
Note 1: OCNG shall be used such that the sall is fully allocated and a constant total transmitted power spectral						

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: Void

Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

#### A.4.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.4.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Subclause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.4.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.4.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.4.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in subclause 6.2.2.2.1.4, the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission..

#### A.4.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### A.4.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

### A.4.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

#### A.4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC

#### A.4.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in section A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.2.1-1. UE capble of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.4.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell in EN-DC

	Config	Description	
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
	2	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
	4	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
Note:	The UE is only recapability	equired to be tested in one of the supported test configurations depending on UE	

Table A.4.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR1 for PSCell in EN-DC

Parameter		ter	Unit	Test-1	Test-2	Comments
SSB Configura	ation	Config 1,2		SSB pattern 1 in	SSB pattern 1 in	As defined in
				FR1	FR1	A.3.10, except for
		Config 3,4		SSB pattern 2 in	SSB pattern 2 in	number of SSBs per
				FR1	FR1	SS-burst and
						SS/PBCH block
					_	index as below
Number of SS	Bs per SS	-burst		2	2	Different from the
00/0001111					0.4	definition in A.3.10
SS/PBCH bloc	ck index			0,1	0,1	Different from the
001 00 0		0		N1/A	001 00 4 4 500	definition in A.3.10
CSI-RS Config	guration	Config 1,2		N/A	CSI-RS.1.1 FDD	As defined in
Described March	( O - II O	Config 3,4		EDD	CSI-RS.2.1 TDD	A.3.1.4
Duplex Mode	for Cell 2	Config 1,2		FDD	FDD	
TDD 0 "		Config 3,4		TDD	TDD	
TDD Configur	ation Note 1	Config 3,4		TDDConf.1.2	TDDConf.1.2	A 1 (' 1 '
OCNG Patterr	OCNG Pattern Note 1			OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH paran	neters	Config 1,2		SR.1.1 FDD	SR.1.1 FDD	As defined in
Note 4		Config 3,4	]	SR.2.1 TDD	SR.2.1 TDD	A.3.1.1.
NR RF Chann	el Number	•		1	1	
EPRE ratio of	PSS to SS	SS	dB			
EPRE ratio of	PBCH_DN	MRS to SSS	dB			
EPRE ratio of	PBCH to F	PBCH_DMRS	dB			
EPRE ratio of	PDCCH_E	MRS to SSS	dB	0	0	
EPRE ratio of	PDCCH to	PDCCH_DMRS	dB			
EPRE ratio of			dB			
	PDSCH to	PDSCH_DMRS	dB			
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be
IIIdex 0	$N_{oc}$	Config 1,2	dBm/15kHz	-98	-98	above configured
	oc	Config 3,4	]	-101	-101	rsrp-ThresholdSSB
	$\hat{E}_s/N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	-17	
IIIUUK I		Config 1,2	dBm/15kHz	-98	-98	

	$N_{oc}$	Config 3,4		-101	-101	Power of SSB with index 1 is set to be
	$\hat{E}_s/N_{oc}$		dB	-17	-17	below configured rsrp-ThresholdSSB
	SS-RSR	P Note 3	dBm/ SCS	-115	-115	181p-1111e81101u33b
Note 2		Config 1,2	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without
10 1100 2	IO Note 2			-62.2/38.16MHz	-62.2/38.16MHz	SSB index 1
ss-PBCH-Blo	ss-PBCH-BlockPower		dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [2].
Configured UE transmitted power ( $P_{ m CMAX,f,c}$ )		dBm	23	23	As defined in clause 6.2.4 in TS 38.101-	
PRACH Configuration			FR1 PRACH configuration 2	FR1 PRACH configuration 3	As defined in A.3.8.2.	
Propagation (	Condition		-	AWGN	AWGN	

- Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
- Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.
- Note 3: Void
- Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

#### A.4.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.4.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for SSB-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2.. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.4.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.4.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.4.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

### A.4.3.2.3 Void

# A.4.4 Timing

## A.4.4.1 UE transmit timing

### A.4.4.1.1 NR UE Transmit Timing Test for FR1

#### A.4.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2. Supported test configurations are shown in Table 4.4.1.1.1-1.

Table A.4.4.1.1.1-1: Supported test configurations for FR1 PSCell

Configuration	Description		
1	LTE FDD, NR FDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz		
2	LTE FDD, NR TDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz		
3	LTE FDD, NR TDD, SSB SCS 30 KHz, data SCS 30 KHz, BW 40 MHz		
4	LTE TDD, NR FDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz		
5	LTE TDD, NR TDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz		
6	LTE TDD, NR TDD, SSB SCS 30 KHz, data SCS 30 KHz, BW 40 MHz		
Note: The UE is only required to be tested in one of the supported test configurations in F depending on UE capability.			

For this test a single NR cell configured as EN-DC PSCell is used. Table A.4.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.4.4.1.1.1-3.

Table A.4.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2	Band Group
SSB ARFCN		1,2,3,4,5,6	Freq1	Freq1	
Duplex Mode		1,4	F	DD	
Duplex Wode		2,3,5,6	T	DD	
		1,4	Not Applicable		
TDD configuration		2,5	TDDC	onf.1.1	1
		3,6	TDDC	onf.1.2	
		1,4	1,4 10: NRB,c = 52		
BW <sub>channel</sub>	MHz	2,5	10: N <sub>RB,c</sub> = 52		]
		3,6	40: N <sub>RB</sub>	40: N <sub>RB,c</sub> = 106	
Initial BWP Configuration		1,2,3,4,5,6	DLBV		
Initial BVVI Configuration		1,2,0,4,0,0	ULBV	/P.0.1	
Dedicated BWP		1,2,3,4,5,6	DLBWP.1.1		
Configuration		, ,-, ,-,-	ULBWP.1.1		
DRx Cycle	ms	1,2,3,4,5,6	N/A	DRX.5 <sup>Note5</sup>	
PDSCH Reference		1,4	SR.1.1 FDD		
measurement channel		2,5	SR.1.	1 TDD	]
dad.con		3,6	SR.2.	1 TDD	

CORESET Reference		1,4	CR.1.	1 FDD	
Channel		2,5	CR.1.	1 TDD	
		3,6	CR.2.	1 TDD	
OCNG Patterns		1,2,3,4,5,6	OCNG p	oattern 1	
PDSCH/PDCCH	kHz	1,2,4,5	1	5	
subcarrier spacing	KIIZ	3,6	3	0	
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH					
DMRS to SSS					
EPRE ratio of PBCH to					
PBCH DMRS					
EPRE ratio of PDCCH	=				
DMRS to SSS					
EPRE ratio of PDCCH to	i.	400450		•	
PDCCH DMRS	dB	1,2,3,4,5,6	0	0	
EPRE ratio of PDSCH	=				
DMRS to SSS					
EPRE ratio of PDSCH to					
PDSCH	_				
EPRE ratio of OCNG					
DMRS to SSS(Note 1)	_				
EPRE ratio of OCNG to					
OCNG DMRS (Note 1)					
$N_{oc}^{ m Note2}$	dBm/15 kHz	1,2,3,4,5,6	-98	-98	
$N_{oc}^{ m Note2}$	dBm/SCS	1,2,4,5	-98	-98	
- 100	ubili/303	3,6	-95	-95	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		1,2,3,4,5,6	3	3	
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	3	3	
SS-RSRP <sup>Note3</sup>	dDm/CCC	1,2,4,5	-95	-95	
	dBm/SCS	3,6	-92	-92	
Io <sup>Note3</sup>	dBm/9.36MHz	1,2,4,5	-65.2	-65.2	
	dBm/38.1MHz	3,6	-59.2	-59.2	
Propagation condition		1,2,3,4,5,6		'GN	
SRS Config		1,2,3,4,5,6	Config1 <sup>Note6</sup>	Config2 <sup>Note6</sup>	
NI CONO I III	1 1 1 1				

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRx related parameters are given in Table A.3.3.5-1

Note 6: SRS configs are given in Table A.4.4.1.1.1-3

Table A.4.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

	Field	Config1	Config 2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceldList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	

SRS-Resource	SRS-Resourceld	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping	0	0	
	startPosition			
	resourceMapping	n1	n1	
	nrofSymbols			
	resourceMapping	n1	n1	
	repetitionFactor			
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping	sl1	sl1	
	c-SRS		_	
	freqHopping b-SRS	0	0	
	freqHopping	0	0	
	b-hop			
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset-p	sl1, 0	sl640, 0	Offset to align with DRx periodicity
	sequenceld	0	0	Any 10 bit number

### A.4.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.1-1 and setup NR PSCell according to parameters given in Table A.4.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-
- 3) The test system shall adjust the timing of the DL path by values given in Table A.4.4.1.1.2-1

Table A.4.4.1.1.2-1: Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value		
	Test1	Test2	
15	+64*64T <sub>c</sub>	+32*64T <sub>c</sub>	
30	+32*64T <sub>c</sub>	+16*64T <sub>c</sub>	

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Section 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within ( $N_{TA} + N_{TA\_offset}$ ) ×T<sub>c</sub> ± T<sub>e</sub> respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX confiured.

5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

### A.4.4.2 UE timer accuracy

### A.4.4.3 Timing advance

### A.4.4.3.1 EN-DC FR1 timing advance adjustment accuracy

### A.4.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.4.4.3.1.2 Test Parameters

6

Note:

Supported test configurations are shown in table A.4.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.4.4.3.1.2-2, A.4.4.3.1.2-3 and A.4.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in section A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.4.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.4.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot n+k for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

The UE is only required to be tested in one of the supported test configurations

Table A.4.4.3.1.2-1: Timing advance supported test configurations

LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Table A.4.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		Cell 1: 1	1 for E-UTRAN PCell
		Cell 2: 2	2 for NR PSCell
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command (T <sub>A</sub> ) value during T1		31	NTA_new = NTA_old for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T <sub>A</sub> ) value during T2		39	$N_{TA\_new} = N_{TA\_old} + 8192 * T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	S	5	
T2	S	5	

Table A.4.4.3.1.2-3: Cell specific test parameters for timing advance

Parameter		Unit	Test1					
Parameter		Unit	T1	T2				
Duplex mode Config 1,4			FD					
Duplex mode	Config 2,3,5,6		TD					
	Config 1,4		licable					
TDD configuration	Config 2,5		TDDCo					
	Config 3,6		TDDCo					
	Config 1,4		10: N <sub>RB</sub>					
BW <sub>channel</sub>	Config 2,5	MHz	10: N <sub>RB</sub>					
	Config 3,6		40: N <sub>RB,</sub>	c = 106				
	Config 1,4	<u> </u>	10: N <sub>RB</sub>					
BWP BW	Config 2,5	MHz	10: N <sub>RB</sub>					
	Config 3,6		$40: N_{RB}$	$_{c} = 106$				
DRx Cycle		ms	Not App					
PDSCH Reference	Config 1,4		SR.1.1	FDD				
measurement channel	Config 2,5		SR.1.1	TDD				
measurement channel	Config 3,6		SR2.1	TDD				
CORESET Reference	Config 1,4	<u> </u>	CR.1.1 FDD					
Channel	Config 2,5		TDD					
Grianner	Config 3,6		CR2.1 TDD					
	Config 1,4		TRS.1.	TRS.1.1 FDD				
TRS configuration	Config 2,5		TRS.1.					
	Config 3,6		TRS.1.2					
OCNG Patterns			OCNG p					
SMTC configuration	Config 1,2,4,5		SMTC.					
	Config 3,6		SMTC.:					
PDSCH/PDCCH	Config 1,2,4,5	kHz	15 k					
subcarrier spacing	Config 3,6	IXI IZ	30 kHz					
PUCCH/PUSCH	Config 1,2,4,5	kHz	15 k					
subcarrier spacing	Config 3,6	IXI IZ	30 kHz					
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS		]						
EPRE ratio of PDCCH DMRS to SSS		dB	0					
EPRE ratio of PDCCH to PDCCH DMRS			GD 0					
EPRE ratio of PDSCH D		]						
EPRE ratio of PDSCH to		]						
EPRE ratio of OCNG DN	MRS to SSS(Note 1)							

EPRE ratio of OCNG to OCNG DMRS (Note			
1)			
$N_{oc}^{ m Note2}$	Note2		-98
1 V oc		Z	-90
Note2	Config 1,2,4,5		-98
$N_{oc}^{ m Note2}$	Config 3,6	dBm/SCS	-95
$\mathbf{\hat{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	3
$\hat{E}_s/N_{oc}$	:	dB	3
	Config 1,2,4,5	dBm/	-67.57
IoNote3	Oomig 1,2,4,0	9.36MHz	01.01
	Config 3,6	dBm/	-62.58
	Johning 5,6		-02.00
Propagati	on condition	-	AWGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.4.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

Field		Value	Comment
c-SRS	Config 1,2,4,5	12	
U-5K5	Config 3,6	24	Fraguency benning is disabled
b-S	SRS	0	Frequency hopping is disabled
b-h	пор	0	
freqDoma	inPosition	0	Frequency domain position of SRS
freqDon	nainShift	0	
groupOrSequ	ienceHopping	neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5=0	Once every 5 slots
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage		nonCodebook	Non-codebook based UL transmission
startPosition		0	resourceMapping setting. SRS on last
nrofSy	nrofSymbols		symbol of slot, and 1symbols for SRS
repetition	repetitionFactor		without repetition.
combO	combOffset-n2		transmission Comb setting
cyclicShift-n2		0	transmissionComb setting
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further	er information see cla	use 6.3.2 in TS 38	.331 [2].

### A.4.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where:

k = 4 for Config 1, 2, 4, 5, and

k = 7 for Config 3, 6

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

# A.4.5 Signaling characteristics

## A.4.5.1 Radio link Monitoring

In the following section, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power [-50] dBm (as defined in TS 38.101-3 [20]) means uplink signal
- UE output power equal to or less than Transmit OFF power [-50] dBm (as defined in TS 38.101-3 [20]) means no uplink signal.

# A.4.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.4.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.4.5.1.1.1-1. The test parameters are given in Tables A.4.5.1.1.1-2, A.4.5.1.1.1-3, and A.4.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.1.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.4.5.1.1.1-1: Supported test configurations for FR1 PSCell

Configuration	Description		
1	LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	LTE FDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5	LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
6	LTE TDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: The UE is only r	UE is only required to pass in one of the supported test configurations in FR1		

Table A.4.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter	Unit	Value
		Test 1
Active E-UTRA PCell		Cell 1
E-UTRA RF Channel Number		1
Active PSCell		Cell 2

RF Channel Nu	mber			2		
Duplex mode Config 1, 4			FDD			
Daplox Hous		Config 2, 3, 5, 6		TDD		
BW <sub>channel</sub>		Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52		
Channel		Config 2, 5	IVII IZ	10: N <sub>RB,c</sub> = 52		
		Config 3, 6		40: N <sub>RB,c</sub> = 32		
DL initial BWP				40. NRB,c = 100		
configuration		Config 1, 2, 3, 4, 5, 6		DLBWP.0.1		
DL dedicated B	\//D	Config 1, 2, 3, 4, 5, 6				
configuration	VVF	Coming 1, 2, 3, 4, 5, 6		DLBWP.1.1		
UL initial BWP		Config 1, 2, 3, 4, 5, 6				
configuration		Coming 1, 2, 3, 4, 3, 0		ULBWP.0.1		
UL dedicated B	\//D	Config 1, 2, 3, 4, 5, 6				
configuration	VVI	Coming 1, 2, 3, 4, 5, 6		ULBWP.1.1		
TDD Configuration	tion	Config 1, 4		Not Applicable		
TDD Conligurar	lion					
		Config 2, 5		TDDConf.1.1		
00050550 /		Config 3, 6		TDDConf.2.1		
CORESET Refe	erence	Config 1, 4		CR.1.1 FDD		
Channel		Config 2, 5		CR.1.1 TDD		
		Config 3, 6		CR.2.1 TDD		
SSB Configurat	ion	Config 1, 4		SSB.1 FR1		
		Config 2, 5		SSB.1 FR1		
		Config 3, 6		SSB.2 FR1		
SMTC Configur	ation	Config 1, 2, 4, 5		SMTC.1		
· ·		Config 3, 6		SMTC.1		
PDSCH/PDCCI	1	Config 1, 2, 4, 5		15 KHz		
subcarrier spac		Config 3, 6		30 KHz		
PRACH Configu		Config 1, 2, 4, 5		Table A.3.8.2.4-1		
1 To torr comig	aration	Config 3, 6		Table A.3.8.2.4-1		
SSB index assigned as RLM RS				0		
		111111111111111111111111111111111111111		OP.1		
CP length	OCNG parameters			Normal		
	riv and Ant	onna Configuration		2x2 Low		
Correlation Matrix and Antenna Configuration						
Out of sync transmission	DCI form			1-0		
		of Control OFDM symbols	005	2		
parameters	Aggregat		CCE	8		
		nypothetical PDCCH RE	dB	4		
		average SSS RE energy				
		nypothetical PDCCH	dB	4		
		nergy to average SSS RE				
	energy					
		ecoder granularity		REG bundle size		
	REG bun	dle size		6		
DRX				OFF		
Gap pattern ID				gp0		
Layer 3 filtering				Enabled		
T310 timer			ms	0		
T311 timer			ms	1000		
N310				1		
N311				1		
CSI-RS configuration		Config 1, 4		[CSI-RS.1.3 FDD]		
•		Config 2, 5		[CSI-RS.1.3 TDD]		
		Config 3, 6		[CSI-RS.2.3 TDD]		
		Config 1, 4		[TRS.1.1 FDD]		
		Config 2, 5		[TRS.1.1 TDD]		
		Config 3, 6		[TRS.1.2 TDD]		
T1			S	1		
T2			S S	0.6		
			S S	0.6		
	T3					
D1			S	0.44		

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.4.5.1.1.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
EPRE	ratio of PDCCH DMRS to SSS	dB			4		
EPRE	ratio of PDCCH to PDCCH DMRS	dB			0		
EPRE	ratio of PBCH DMRS to SSS	dB					
EPRE	ratio of PBCH to PBCH DMRS	dB					
EPRE	ratio of PSS to SSS	dB					
EPRE	ratio of PDSCH DMRS to SSS	dB			0		
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE	EPRE ratio of OCNG to OCNG DMRS						
SNR	SNR Config 1, 4		1	-7	-15	-4.5	1
	Config 2, 5		1	-7	-15	-4.5	1
Config 3, 6			1	-7	-15	-4.5	1
N Config 1, 4		dBm/	-98				
$N_{oc}$	Config 2, 5		-98				
Config 3, 6		KHz	-98				
Propagation condition				TDL-C	300ns	100Hz	

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Table A.4.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1				
rieiu	Value				
gapOffset	0				

Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap).

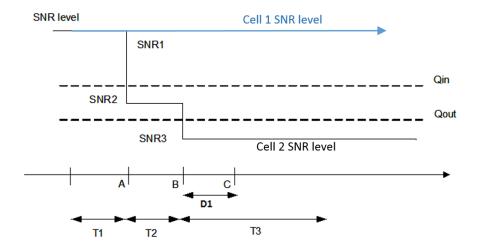


Figure A.4.5.1.1.1-1: SNR variation for out-of-sync testing

### A.4.5.1.1.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.2 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

### A.4.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.4.5.1.2.1-1. The test parameters are given in Tables A.4.5.1.2.1-2, and A.4.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.2.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.4.5.1.2.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
1	LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only	required to pass in one of the supported test configurations in FR1

Table A.4.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCel			Cell 1
E-UTRA RF Channel	Number		1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 106
DL initial BWP	Config 1, 2, 3, 4, 5,		DLBWP.0.1
configuration	6		DEBVI .o.1
DL dedicated BWP	Config 1, 2, 3, 4, 5,		DLBWP.1.1
configuration	6		DEBWY
UL initial BWP	Config 1, 2, 3, 4, 5,		ULBWP.0.1
configuration	6		0221111011
UL dedicated BWP	Config 1, 2, 3, 4, 5,		ULBWP.1.1
configuration	6		N 4 8 11
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
0005055	Config 3, 6		TDDConf.2.1
CORESET	Config 1, 4		CR.1.1 FDD
Reference Channel	Config 2, 5		CR.1.1 TDD
000 0 " "	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
OMTO O a a fi acception	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
DD COLL/DD COLL	Config 3, 6		SMTC.1
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz
subcarrier spacing	Config 3, 6		30 KHz
PRACH	Config 1, 2, 4, 5		Table A.3.8.2.4-1
Configuration	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned	as RLM RS		0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
	DCI format		1-0
l l	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
LL	, iggrogation lovel	OOL	7

	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
Out of sync	DCI format		1-0	
transmission parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
Layer 3 filtering			Enabled	
T310 timer		ms	2000	
T311 timer		ms	1000	
N310			1	
N311			1	
CSI-RS	Config 1, 4		[CSI-RS.1.3 FDD]	
configuration	Config 2, 5		[CSI-RS.1.3 TDD]	
	Config 3, 6		[CSI-RS.2.3 TDD]	
CSI-RS for	Config 1, 4		[TRS.1.1 FDD]	
tracking	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
T1		S	0.5	
T2		S	0.4	
T3		S	1.46	
T4		S	0.4	
T5		S	1	
D1		S	0.42	
Note 1: All configurations are assigned to the UE prior to the start of time period T1.				

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.4.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5

EPKE	ratio of PDCCH DMRS to SSS	dB	4				
EPRE	ratio of PDCCH to PDCCH DMRS	dB	0				
EPRE	ratio of PBCH DMRS to SSS	dB					
EPRE	ratio of PBCH to PBCH DMRS	dB					
EPRE	ratio of PSS to SSS	dB					
EPRE	ratio of PDSCH DMRS to SSS	dB			0		
EPRE	ratio of PDSCH to PDSCH DMRS	dB	7				
EPRE	ratio of OCNG DMRS to SSS	dB	3				
EPRE	ratio of OCNG to OCNG DMRS	dB					
SNR	Config 1, 4	dB	1	-7	-15	-4.5	1
	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1 -7 -15 -4.5 1		1		
λΙ	Config 1, 4	dBm/	-98				
IV oc	Config 2, 5	15	-98				
	Config 3, 6	KHz -98					
Propag	gation condition			TDL-C	300ns	100Hz	
EPRE EPRE EPRE EPRE EPRE SNR	ratio of PSS to SSS ratio of PDSCH DMRS to SSS ratio of PDSCH to PDSCH DMRS ratio of OCNG DMRS to SSS ratio of OCNG to OCNG DMRS  Config 1, 4  Config 2, 5  Config 3, 6  Config 1, 4  Config 2, 5  Config 3, 6  Config 3, 6  Config 3, 6	dB dB dB dB dB dB	1 1 1	-7 -7	-15 -15 -15 -98 -98	-4.5 -4.5	

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.2.1-1.
- Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in section A.3.6.

Table A.4.5.1.2.1-4: Void

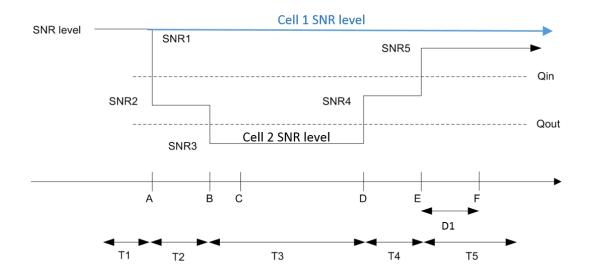


Figure A.4.5.1.2.1-1: SNR variation for in-sync testing

### A.4.5.1.2.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

#### A.4.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.4.5.1.3.1-1. The test parameters are given in Tables A.4.5.1.3.1-2 and A.4.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.3.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.4.5.1.3.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
1	LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is o	only required to pass in one of the supported test configurations in FR1

Table A.4.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode

Para	meter	Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel No	umber		1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 106
DL initial BWP	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
configuration			DEDVVI .0.1
DL dedicated BWP	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
configuration			DEDVVI .I.I
UL initial BWP	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
configuration			CLDVVI .O.1

		T.	
UL dedicated BWP	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
configuration			
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
CORESET Reference	Config 1, 4		CR.1.1 FDD
Channel	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz
subcarrier spacing	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1
· · · · · · · · · · · · · · · · · · ·	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned as			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		
Parameters	Aggregation level	CCE	8
<del> </del>	Ratio of hypothetical	dB	4
	PDCCH RE energy to	QD	T
	average SSS RE energy		
<del> </del>	Ratio of hypothetical	dB	4
	PDCCH DMRS energy	l GD	<b>T</b>
	to average SSS RE		
	energy		
	DMRS precoder		REG bundle size
	granularity		TREO Barraro dizo
<u> </u>	REG bundle size		6
DRX Configuration	TEO Buriale Size		[DRX.4]
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
			1000
T311 timer N310		ms	1
N311 CSI-RS configuration	Config 1 4		1 [CSI-RS.1.3 FDD]
Col-Ro conliguration	Config 1, 4		
	Config 2, 5		[CSI-RS.1.3 TDD]
COLDO for two slains	Config 3, 6		[CSI-RS.2.3 TDD]
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]
	Config 2, 5		[TRS.1.1 TDD]
T4	Config 3, 6		[TRS.1.2 TDD]
T1		S	4
T2		S	3
T3		S	3
D1		S	2.44

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

E-UTRAN is in non-DRX mode under test. Note 3:

Table A.4.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit		Test 1	
			T1	T2	T3
EPRE ratio	of PDCCH DMRS to SSS	dB		4	
EPRE ratio	of PDCCH to PDCCH DMRS	dB		0	
EPRE ratio	of PBCH DMRS to SSS	dB			
EPRE ratio	of PBCH to PBCH DMRS	dB			
EPRE ratio	of PSS to SSS	dB		0	
EPRE ratio	of PDSCH DMRS to SSS	dB	dB		
EPRE ratio	of PDSCH to PDSCH DMRS	DMRS dB			
EPRE ratio	of OCNG DMRS to SSS	dB			
EPRE ratio	of OCNG to OCNG DMRS	dB			
SNR	Config 1, 4	dB	1	-7	-15
	Config 2, 5		1	-7	-15
	Config 3, 6		1	-7	-15
M	Config 1, 4	dBm/15		-98	
$N_{oc}$	Config 2, 5	KHz	Hz -98		
	Config 3, 6 -98				
Propagation	condition		Т	DL-C 300ns 100H	lz

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.4.5.1.3.1-1.
- Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.4.5.1.3.1-4: Void Table A.4.5.1.3.1-5: Void

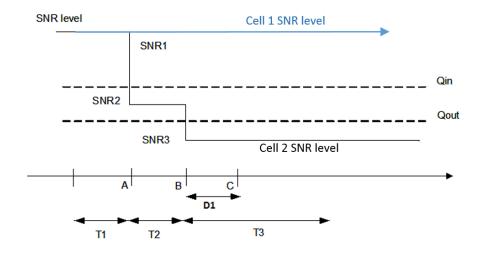


Figure A.4.5.1.3.1-1: SNR variation for out-of-sync testing

### A.4.5.1.3.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.4 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

### A.4.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.4.5.1.4.1-1. The test parameters are given in Tables A.4.5.1.4.1-2, and A.4.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.4.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Configuration Description LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode 1 2 LTE FDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode 3 LTE FDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode 4 LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, FDD duplex mode 5 LTE TDD, NR 15 KHz SSB SCS, 10 MHz bandwidth, TDD duplex mode 6 LTE TDD, NR 30 KHz SSB SCS, 40 MHz bandwidth, TDD duplex mode The UE is only required to pass in one of the supported test configurations in FR1 Note:

Table A.4.5.1.4.1-1: Supported test configurations for FR1 PSCell

Table A.4.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Nu	E-UTRA RF Channel Number		1
Active PSCell	Active PSCell		Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB c</sub> = 106

DL initial BWP configura	tion Config 1, 2, 3, 4, 5,		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configura	tion Config 1, 2, 3, 4, 5,		ULBWP.0.1
UL dedicated BWP	6 Config 1, 2, 3, 4, 5,		
configuration	6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
CORESET Reference	Config 1, 4		CR.1.1 FDD
Channel	Config 2, 5		CR.1.1 TDD
CCD Configuration	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1 SSB.1 FR1
	Config 2, 5 Config 3, 6	+	SSB.1 FR1 SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
Sivi 10 Configuration	Config 3, 6		SMTC.1
PDSCH/PDCCH subcar			15 KHz
spacing	Config 3, 6		30 KHz
PRACH Configuration	•		Table A.3.8.2.4-1
PRACE Configuration	Config 1, 2, 4, 5		
	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned as I	RLM RS		0
OCNG parameters			OP.1
CP length	ntanna Canfinunation		Normal
Correlation Matrix and A	<u> </u>		2x2 Low
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			Table A.3.3.3-1
Gap pattern ID			N.A.
Layer 3 filtering			Enabled

T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1, 4		[CSI-RS.1.3 FDD]
	Config 2, 5		[CSI-RS.1.3 TDD]
	Config 3, 6		[CSI-RS.2.3 TDD]
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]
	Config 2, 5		[TRS.1.1 TDD]
Config 3, 6			[TRS.1.2 TDD]
T1		S	4
T2		S	1.6
T3		S	1.36
T4		S	0.4
T5		S	1.4
D1		S	1

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.4.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in DRX mode

Parameter	Unit			Test 1		
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB			4		
EPRE ratio of PDCCH to PDCCH DMRS	dB			0		
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB			0		
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR Config 1, 4	dB	1	-7	-15	-4.5	1
Config 2, 5		1	-7	-15	-4.5	1
Config 3, 6		1	-7	-15	-4.5	1
N Config 1, 4	dBm/15	-98				
N <sub>oc</sub> Config 1, 4 Config 2, 5	KHz	-98				
Config 3, 6		-98				
Propagation condition			TDL	-C 300ns 10	00Hz	

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.4.1-1.

Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in section A.3.6.

Table A.4.5.1.4.1-4: Void Table A.4.5.1.4.1-5: Void

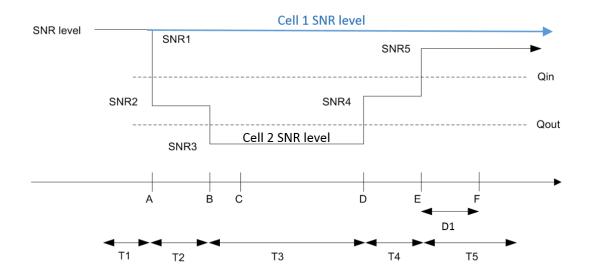


Figure A.4.5.1.4.1-1: SNR variation for in-sync testing

#### A.4.5.1.4.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.4.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.5.1-1, A.4.5.1.5.1-2, A.4.5.1.5.1-3, and A.4.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.4.5.1.5.1-1: Supported test configurations for FR1 PSCell

Configuration	Description			
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.4.5.1.5.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode

Parameter		Value	
		Test 1	
Cell		Cell 1	
		1	
		Cell 2	
ber		2	
Config 1, 4		FDD	
		TDD	
		Not Applicable	
		TDDConf.1.1	
		TDDConf.2.1	
		CCR.1.1 FDD	
		CCR.1.1 TDD	
Config 3, 6		CCR.2.1 TDD	
Config 1, 4		SSB.1 FR1	
Config 2, 5		SSB.1 FR1	
		SSB.2 FR1	
Config 1, 2, 4, 5		SMTC.1	
		SMTC.1	
Config 1, 2, 4, 5		15 KHz	
Config 3, 6		30 KHz	
Config 1, 4		TRS.1.1 FDD	
Config 2, 5		TRS.1.1 TDD	
Config 3, 6		TRS.1.2 TDD	
gned as RLM RS		Same as TRS configuration	
s		OP.1	
		Normal	
and Antenna Configuration		2x2 Low	
DCI format		1-0	
Number of Control OFDM symbols		2	
	CCE	8	
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	
	Cell Inel Number  Der  Config 1, 4 Config 2, 3, 5, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 2, 4, 5 Config 3, 6 Config 1, 2, 4, 5 Config 3, 6 Config 1, 2, 4, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 3, 6 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 In Config 2, 5 In Config 3, 6 In Config 3,	Cell Inel Number  Der  Config 1, 4 Config 2, 3, 5, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6  Config 1, 4 Config 2, 5 Config 3, 6 Config 1, 2, 4, 5 Config 3, 6 Config 1, 2, 4, 5 Config 3, 6 Config 1, 4 Config 2, 5 Config 3, 6 Config 4 Config 5 Config 6 Config 7 Config 8 Config 9 Config 9 Config 1 Config 9 Config 1 Config 9 Config 1 Config 1 Config 9 Config 1 Config 9 Config 1 Config 1 Config 1 Config 1 Config 1 Config 2 Config 3 Config 3 Config 3 Config 3 Config 3 Config 3 Config 4 Config 4 Config 6 Config 1 Config 6 Config 1 Config 6 Config 1 Config 6 Config 7 Config 8 Config 1 Config 8 Config 1 Config 1 Config 8 Config 1 Config 1 Config 8 Config 1 Config 1 Config 1 Config 1 Config 1 Config 2 Config 3 Config 3 Config 3 Config 3 Config 4 Config 4 Config 4 Config 4 Config 4 Config 5 Config 6 Config 1 Config 6 Config 1 Config 7 Config 8 Config 1 Config 8 Config 8 Config 1 Config 8 Config 8 Config 8 Config 8 Config 9 Config 8 Config 8 Config 8 Config 9 Config 8 Config 9 Config 8 Config 9 Config 8 Config 9 Config	

	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
Layer 3 filtering			Enabled	
T310 timer		ms	0	
T311 timer	T311 timer		1000	
N310			1	
N311			1	
CSI-RS	Config 1, 4		CSI-RS1.2 FDD	
configuration	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
T1		S	1	
T2	T2		0.4	
T3		S	0.6	
D1		S	0.24	
	ecific PDCCH is not transmitted AN is in non-DRX mode under t			

Table A.4.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

F	Parameter	Unit	Test 1					
			T1	T2	T3			
PDCCH_I	oeta	dB		4				
PDCCH_I	DMRS_beta	dB		4				
PBCH_be	eta	dB						
PSS_beta	ì	dB						
SSS_beta	ì	dB	0			0		
PDSCH_k	oeta	dB						
OCNG_be	eta	dB						
SNR	Config 1, 4	dB	1	-7	-15			
	Config 2, 5		1	-7	-15			
	Config 3, 6		1	-7	-15			
N <sub>oc</sub>	Config 1, 4	dBm/15K	-98					
00	Config 2, 5	Hz	-98					
	Config 3, 6		-98					

Propagat	tion condition		TDL-C 300ns 100Hz		
Note 1:	1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2:	The uplink resource period T1.	s for CSI rep	porting are assigned to the UE prior to the start of time		
Note 3:	NZP CSI-RS resoure the start of time peri		guration for CSI reporting are assigned to the UE prior to		
Note 4:	Measurement gap c	onfiguration	is assigned to the UE prior to the start of time period T1.		
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.				
Note 6:	The signal contains	PDCCH for	UEs other than the device under test as part of OCNG.		
Note 7:	SNR levels correspo	ond to the sig	gnal to noise ratio over the SSS REs.		
Note 8:	The SNR in time per respectively in figure		and T3 is denoted as SNR1, SNR2 and SNR3 -1.		
Note 9:			or testing a UE which supports 2RX on at least one band. rts 4RX on all bands, the SNR during T3 is [A.3.6].		

Table A.4.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

	Field	
	gapOffset	0
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned. (Ensure that RLM partially overlapped with m gap)	oundary RS is

Table A.4.5.1.5.1-4: Void

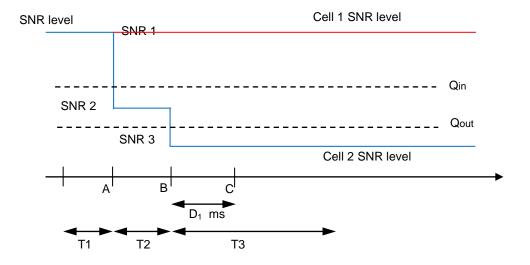


Figure A.4.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

### A.4.5.1.5.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 (E-UTRAN PCell).

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

### A.4.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.6.1-1, A.4.5.1.6.1-2, and A.4.5.1.6.1-3 below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.4.5.1.6.1-1: Supported test configurations for FR1 PSCell

Configuration	Description			
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.4.5.1.6.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	
Active E-UTRA PCel			Cell 1	
E-UTRA RF Channe	Number		1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
RMC CORESET	Config 1, 4		CCR.1.1 FDD	
Reference Channel	Config 2, 5		CCR.1.1 TDD	

		0 " 0 0	T	00004700
000 0 "	Config 3, 6			CCR.2.1 TDD
SSB Configura	SSB Configuration Config 1, 4			SSB.1 FR1
	Config 2, 5			SSB.1 FR1
Config 3, 6			SSB.2 FR1	
SMTC		Config 1, 2, 4, 5		SMTC.1
Configuration		Config 3, 6		SMTC.1
PDSCH/PDCC		Config 1, 2, 4, 5		15 KHz
subcarrier spa		Config 3, 6		30 KHz
TRS configura	tion	Config 1, 4		TRS.1.1 FDD
		Config 2, 5		TRS.1.1 TDD
		Config 3, 6		TRS.1.2 TDD
csi-RS-Index a		d as RLM RS		Same as TRS configuration
OCNG parame	eters			OP.1
CP length				Normal
Correlation Ma Configuration	trix and	d Antenna		2x2 Low
•	DCI fo	ormat		1-0
		per of Control OFDM		2
Out of sync	symb	ols		
transmission		egation level	CCE	8
parameters		of hypothetical	dB	4
	PDC	CH RE energy to		
		ige CSI-RS RE		
	energ			
		of hypothetical	dB	4
		CH DMRS energy to		
	avera	ige CSI-RS RE		
	energ	Jy		
		S precoder granularity		REG bundle size
	REG	bundle size		6
	DCI fo	ormat		1-0
	Numb	per of Control OFDM		2
In sync	symb	ols		
transmission		egation level	CCE	4
parameters	Ratio of hypothetical		dB	0
		CH RE energy to		
	average CSI-RS RE			
	energy			
	Ratio of hypothetical		dB	0
		CH DMRS energy to		
		ige CSI-RS RE		
	energ			DEO Francis
		S precoder granularity		REG bundle size
DDV	KEG	bundle size		6
DRX				OFF.
Gap pattern ID				N.A.
Layer 3 filtering			Enabled	
T310 timer		ms	0	
T311 timer		ms	1000	
N310			1	
N311			1	
CSI-RS	Config 1, 4			CSI-RS.1.2 FDD
configuration				CSI-RS.1.2 TDD
T4	Config 3, 6			CSI-RS.2.2 TDD
	T1		S	1
T2		S	0.4	
T3			S	0.6
D1			S	0.24
Note 1: LIF-	snecifi	c PDCCH is not transmi	itted after T1 sta	arte

Note 1: UE-specific PDCCH is not transmitted after T1 starts.

Note 2: E-UTRAN is in non-DRX mode under test.

Table A.4.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
PDCCH_b	eta	dB	4				
PDCCH_D	MRS_beta	dB			4		
PBCH_bet	ta	dB					
PSS_beta		dB					
SSS_beta		dB	0				
PDSCH_b	eta	dB					
OCNG_be	ta	dB					
SNR	Config 1, 4	dB	1	-7	-15	-4.5	1
	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
N	Config 1, 4	dBm/15KHz	-98				
$N_{oc}$	Config 2, 5				-98		
	Config 3, 6		-98				
Propagation	on condition			TD	L-C 300ns 10	0Hz	

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.4.5.1.6.1-3A: Void

Table A.4.5.1.6.1-4: Void

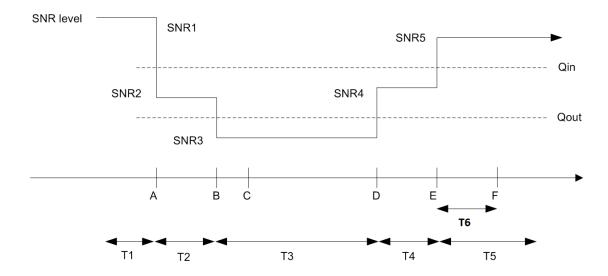


Figure A.4.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.4.5.1.6.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

#### A.4.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.7.1-1, A.4.5.1.7.1-2, and A.4.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements without gap.

Table A.4.5.1.7.1-1: Supported test configurations for FR1 PSCell

Configuration	Description			
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.4.5.1.7.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channe	E-UTRA RF Channel Number		1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
RMC CORESET	Config 1, 4		CCR.1.1 FDD
Reference Channel	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC	Config 1, 2, 4, 5		SMTC.1
Configuration	Config 3, 6		SMTC.1
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz
subcarrier spacing	Config 3, 6		30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
csi-RS-Index assigne	ed as RLM RS		0 Same as TRS configuration
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix an	d Antenna		2x2 Low
Configuration Out of sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of	dB	4
	hypothetical PDCCH RE		
	energy to average CSI-RS RE		
	energy		

	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.7
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS	Config 1, 4		CSI-RS.1.2 FDD
configuration	Config 2, 5		CSI-RS.1.2 TDD
	Config 3, 6		CSI-RS.2.2 TDD
T1		S	1
T2		S	0.4
T3		S	0.6
D1	D1		0.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test.			

Table A.4.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
PDCCH_b	oeta	dB		4	
PDCCH_[	DMRS_beta	dB		4	
PBCH_be	ta	dB			
PSS_beta		dB			
SSS_beta	l	dB	0		
PDSCH_b	eta	dB			
OCNG_be	eta	dB			
SNR	Config 1, 4	dB	1	-7	-15
	Config 2, 5		1	-7	-15
	Config 3, 6		1	-7	-15
Λ/ Config 1, 4		dBm/15KHz	-98		
$N_{oc}$ Config 1, 4 Config 2, 5			-98		
	Config 3, 6			-98	

Propagat	Propagation condition		TDL-C 300ns 100Hz		
Note 1:	OCNG shall be used such that the resources in Cell 2 are fully allocated and a constan				
	total transmitted pov	ver spectral densi	ty is achieved for all OFDM symbols.		
Note 2:	•	s for CSI reporting	g are assigned to the UE prior to the start of time		
	period T1.				
Note 3:		•	on for CSI reporting are assigned to the UE prior to		
	the start of time peri				
Note 4:	Measurement gap c	onfiguration is ass	signed to the UE prior to the start of time period		
	T1.				
Note 5:	The timers and laye	r 3 filtering related	parameters are configured prior to the start of		
	time period T1.				
Note 6:	The signal contains	PDCCH for UEs of	other than the device under test as part of OCNG.		
Note 7:	SNR levels correspond	and to the signal to	o noise ratio over the SSS REs.		
Note 8:	The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3				
	respectively in figure A.4.5.1.7.1-1.				
Note 9:	. , ,	SNR values are specified for testing a UE which supports 2RX on at least one			
	band. For testing of	a UE which suppo	orts 4RX on all bands, the SNR during T3 is		
	[A.3.6].		,		

Table A.4.5.1.7.1-3A: Void

Table A.4.5.1.7.1-4: Void

Table A.4.5.1.7.1-5: Void

Table A.4.5.1.7.1-6: Void

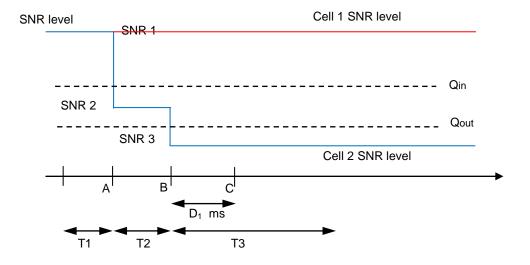


Figure A.4.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

### A.4.5.1.7.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 (E-UTRAN PCell).

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

### A.4.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.8.1-1, A.4.5.1.8.1-2, A.4.5.1.8.1-3 and A.4.5.1.8.1-3A below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.4.5.1.8.1-1: Supported test configurations for FR1 PSCell

Configuration	Description		
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5 LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mod			
6 LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only	Note: The UE is only required to pass in one of the supported test configurations in FR1		

Table A.4.5.1.8.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in DRX mode

Parameter		Unit	Value
			Test 8
Active E-UTRA P	PCell		Cell 1
E-UTRA RF Cha			1
Active PSCell			Cell 2
RF Channel Num	nber		2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD	Config 1, 4		Not Applicable
Configuration	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
RMC	Config 1, 4		CCR.1.1 FDD
CORESET	Config 2, 5		CCR.1.1 TDD
Reference	Config 3, 6		CCR.2.1 TDD
Channel			

SSB	Config 1, 4		SSB.1 FR1
Configuration	Config 2, 5		SSB.1 FR1
Comiguration	Config 3, 6		SSB.2 FR1
SMTC	Config 1, 2, 4, 5		SMTC.1
Configuration	Config 3, 6		SMTC.1
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz
subcarrier			
spacing	Config 3, 6		30 KHz
TRS	Config 1, 4		TRS.1.1 FDD
configuration	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
csi-RS-Index assi	igned as RLM RS		Same as TRS configuration
OCNG parameter	rs .		OP.1
CP length			Normal
Correlation Matrix	and Antenna		2x2 Low
Configuration			
Out of sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder		REG bundle size
	granularity		_
77.	REG bundle size		6
DRX			DRX.7
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS	Config 1, 4		CSI-RS.1.2 FDD
configuration	Config 2, 5		CSI-RS.1.2 TDD
	Config 3, 6		CSI-RS.2.2 TDD
T1		S	1
T2		S	0.4

T3		S	0.6	
D1		S	0.44	
Note 1:	UE-specific PDCCH is not transmitted after T1 starts.			
Note 2:	E-UTRAN is in non-DRX mode under test.			

Table A.4.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
PDCCH_b	eta	dB			4		
PDCCH_D	MRS_beta	dB			4		
PBCH_bet	ta	dB					
PSS_beta		dB					
SSS_beta		dB			0		
PDSCH beta		dB	1				
OCNG_be	ta	dB	1				
SNR	Config 1, 4	dB	1	-7	-15	-4.5	1
	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
N <sub>oc</sub> Config 1, 4		dBm/15KHz	-98				
Config 2, 5			-98				
Config 3, 6			-98				
Propagation	on condition			TD	L-C 300ns 10	0Hz	

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.4.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode

	Field		
	gapOffset	0	
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned. (Ensure that RLM partially overlapped with m gap)	undary RS is	

Table A.4.5.1.8.1-4: Void

Table A.4.5.1.8.1-5: Void

Table A.4.5.1.8.1-6: Void

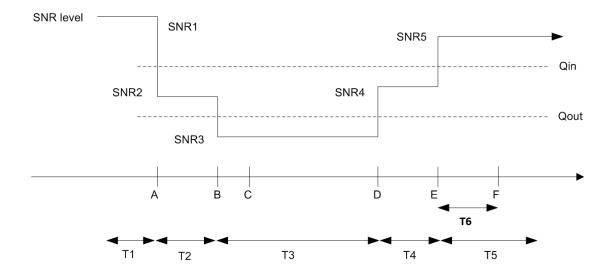


Figure A.4.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

#### A.4.5.1.8.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

## A.4.5.2 Interruption

# A.4.5.2.1 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

#### A.4.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS38.133 section 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.1.1-2 and A.4.5.2.1.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.1.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. CORESET indicating a new transmission on PSCell shall be sent continuously during the whole time duration to ensure UE would not enter DRX state on PSCell.

Table A.4.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Config	Description		
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: The UE is only	Note: The UE is only required to be tested in one of the supported test configurations		

Table A.4.5.2.1.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.4	DRX related parameters are defined in
		DKA.4	Table A.3.3.4-1
Measurement gap pattern		OFF	
Id		OFF	
T1	S	10	

Table A.4.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parame	ter	Unit	Cell 2	
Frequency Range			FR1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6	]	TDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2,5	1	TDDConf.1.1	
	Config 3,6	1	TDDConf.2.1	
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52	
	Config 2,5	1	10: N <sub>RB,c</sub> = 52	
	Config 3,6	]	40: N <sub>RB,c</sub> = 106	
Initial BWP	Config 1,4		DLBWP.0	
Configuration	Config 2,5	]	DLBWP.0	
	Config 3,6	]	DLBWP.0	
PDSCH Reference	Config 1,4		SR.1.1 FDD	
measurement channel	Config 2,5		SR.1.1 TDD	
	Config 3,6	]	SR2.1 TDD	
RMSI CORESET	Config 1,4		CR.1.1 FDD	
parameters	Config 2,5	]	CR.1.1 TDD	
	Config 3,6	]	CR2.1 TDD	
PDCCH CORESET	Config 1,4		CCR.1.1 FDD	
parameters	Config 2,5	]	CCR.1.1 TDD	
	Config 3,6		CCR2.1 TDD	

OCNG Patterns			OP.1		
SMTC Configuration			SMTC.1		
TRS configuration			TRS.1.1 TDD		
TCI state			TCI.State.0		
SSB Configuration	Config 1,2,4,5		SSB.1 FR1		
Config 3,6			SSB.2 FR1		
Correlation Matrix and Ar	ntenna		1x2 Low		
Configuration					
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS	to SSS				
EPRE ratio of PBCH to PBC	-				
EPRE ratio of PDCCH DMR	S to SSS				
EPRE ratio of PDCCH to PD	OCCH DMRS	dB	0		
EPRE ratio of PDSCH DMR					
EPRE ratio of PDSCH to PD					
EPRE ratio of OCNG DMRS					
EPRE ratio of OCNG to OCI	NG DMRS (Note 1)				
Noc <sup>Note 2</sup>		dBm/15	-104		
		kHz	101		
SS-RSRP Note 3		dBm/15	-87		
		kHz	-01		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17		
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17		
Io <sup>Note3</sup>	Confin 4 2 4 5	dBm/	57.0		
	Config 1,2,4,5		-57.9		
	0 " 00	dBm/	<b>54.0</b>		
Config 3,6		38.16MHz	-51.8		
Time offset to cell1 Note 4		μS	33		
Propagation Condition			AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power					
spectral density is achieved for all OFDM symbols.					
•	Nets 2: Interference from other cells and raise accuracy as the specified in the test is accurated to be constant over				

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N₀c to be fulfilled.
- Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

Table A.4.5.2.1.1-4: Void

### A.4.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.1.2-1.

Table A.4.5.2.1.2-1: Interruption length X at transition between active and non-active during DRX

11	NR Slot	Interruption length X	
	length (ms)	Sync	
0	1	1	
1	0.5	1	

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.2.2 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

### A.4.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS 38.133 section 8.2.1.2. Supported test configurations are shown in table A.4.5.2.2.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.2.1-2 and A.4.5.2.2.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.2.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell . The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the whole time duration to ensure UE would not enter DRX state on PSCell.

Table A.4.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Co	onfig	Description		
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
	3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
	6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: T	ote: The UE is only required to be tested in one of the supported test configurations			

Table A.4.5.2.2.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.6	DRX related parameters are defined in
		DKA.0	Table A.3.3.6-1
Measurement gap pattern		OFF	
Id		OFF	
T1	S	10	

Table A.4.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parame	ter	Unit	Cell 2	
Frequency Range			FR1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6	1	TDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2,5	]	TDDConf.1.1	
	Config 3,6	]	TDDConf.2.1	
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52	
	Config 2,5	]	10: N <sub>RB,c</sub> = 52	
	Config 3,6	]	40: N <sub>RB,c</sub> = 106	
Initial BWP	Config 1,4		DLBWP.0	
Configuration	Config 2,5	]	DLBWP.0	
	Config 3,6	]	DLBWP.0	
PDSCH Reference	Config 1,4		SR.1.1 FDD	
measurement channel	Config 2,5	]	SR.1.1 TDD	
	Config 3,6	]	SR2.1 TDD	
RMSI CORESET	Config 1,4		CR.1.1 FDD	
parameters	Config 2,5	]	CR.1.1 TDD	
	Config 3,6	]	CR2.1 TDD	
PDCCH CORESET	Config 1,4		CCR.1.1 FDD	
parameters	Config 2,5	]	CCR.1.1 TDD	
	Config 3,6	]	CCR2.1 TDD	
OCNG Patterns			OP.1	
SMTC Configuration	SMTC Configuration		SMTC.1	
TRS configuration			TRS.1.1 TDD	
TCI state		TCI.State.0		
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	
	Config 3,6		SSB.2 FR1	

Correlation Matrix and Antenna			1x2 Low	
Configuration				
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS	to SSS	1		
EPRE ratio of PBCH to PBC	H DMRS	1		
EPRE ratio of PDCCH DMR	S to SSS			
EPRE ratio of PDCCH to PD	OCCH DMRS	dB	0	
EPRE ratio of PDSCH DMR	S to SSS			
EPRE ratio of PDSCH to PD	SCH			
EPRE ratio of OCNG DMRS	to SSS(Note 1)			
EPRE ratio of OCNG to OCI	NG DMRS (Note 1)			
N <sub>oc</sub> Note 2		dBm/15	-104	
			-104	
SS-RSRP Note 3		dBm/15	07	
		kHz	-87	
Ês/I <sub>ot</sub>		dB	17	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	
Io <sup>Note3</sup>	Canfin 4 2 4 5	dBm/	57.0	
	Config 1,2,4,5	9.36MHz	-57.9	
	0 # 00		54.0	
Config 3,6		38.16MHz	-51.8	
Time offset to cell1 Note 4		μS	500	
Propagation Condition			AWGN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

Table A.4.5.2.2.1-4: Void

#### A.4.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.2.2-1.

Table A.4.5.2.2.2-1: Interruption length X at transition between active and non-active during DRX

и	NR Slot	Interruption length X	
	length (ms)	Async	
0	1	2	
1	0.5	2	

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.2.3 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

#### A.4.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 section 8.2.1.2. Supported test configurations are shown in table A.4.5.2.3.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.3.1-2 and A.4.5.2.3.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.3.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

Config	Description			
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to be tested in one of the supported test configurations				

Table A.4.5.2.3.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
ld		OH	
SCell measurement cycle	mc	640	
(measCycleSCell)	ms	040	
T1	S	10	

Table A.4.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parame	ter	Unit	Cell 2	Cell 3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	FDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	Not Applicable
	Config 2,5		TDDConf.1.1	TDDConf.1.1
	Config 3,6		TDDConf.2.1	TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
Initial DL BWP	Config 1,4		DLBWP.0.1	DLBWP.0.1
Configuration	Config 2,5		DLBWP.0.1	DLBWP.0.1
	Config 3,6		DLBWP.0.1	DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1	DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1	DLBWP.1.1
	Config 3,6		DLBWP.1.1	DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1	ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1	ULBWP.0.1
	Config 3,6		ULBWP.0.1	ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1	ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1	ULBWP.1.1
	Config 3,6		ULBWP.1.1	ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD	-
measurement channel	Config 2,5		SR.1.1 TDD	-
	Config 3,6		SR2.1 TDD	-
RMSI CORESET	Config 1,4		CR.1.1 FDD	CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD	CR.1.1 TDD
	Config 3,6		CR2.1 TDD	CR2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR2.1 TDD	CCR2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD
	Config 2,5	<u> </u>	TRS.1.1 TDD	TRS.1.1 TDD
	Config 3,6		TRS.1.1 TDD	TRS.1.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration	SMTC Configuration		SMTC.1	SMTC.1
TCI state			TCI.State.0	TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1

Correlation Matrix and Antenna			1x2 Low	1x2 Low	
Configuration					
EPRE ratio of PSS to SSS	EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS	to SSS	1			
EPRE ratio of PBCH to PBC	H DMRS				
EPRE ratio of PDCCH DMR					
EPRE ratio of PDCCH to PD		dB	0	0	
EPRE ratio of PDSCH DMR		<u> </u>			
EPRE ratio of PDSCH to PD		_			
EPRE ratio of OCNG DMRS	, ,	_			
EPRE ratio of OCNG to OCI	NG DMRS (Note 1)				
N <sub>oc</sub> Note 2		dBm/15	-104	-104	
		kHz			
SS-RSRP Note 3		dBm/15	-87	-87	
		kHz	0,1	0,	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	17	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	17	
Io <sup>Note3</sup>	Config 1 2 4 5	dBm/	-57.9	-57.9	
	Config 1,2,4,5	9.36MHz			
	Config 3,6		F1 0	E4 0	
			-51.8	-51.8	
Time offset to cell1 Note 4	Time offset to cell1 Note 4		33	33	
Time offset to cell2 Note 5		μS	-	3	
Propagation Condition			AWGN	AWGN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
- Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

#### A.4.5.2.3.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.3.2-1 if the NR PSCell is not in the same band as the deactivated SCell or Table A.4.5.2.3.2-2 if the NR PSCell is in the same band as the deactivated SCell.

Table A.4.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length	
0	1	1	
1	0.5	1	

Table A.4.5.2.3.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length	
0	1	1 + SMTC duration	
1	0.5	2 + SMTC duration	

Each interruption on E-UTRAN PCell shall not exceed 1ms + SMTC duration subframes for intraband EN-DC, 1 subframe for synchronous interband EN-DC.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.2.4 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

### A.4.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 section 8.2.1. Supported test configurations are shown in table A.4.5.2.4.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.4.1-2 and A.4.5.2.4.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.4.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

Config	Description		
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to be tested in one of the supported test configurations			

Table A.4.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1.2	One is E-UTRAN RF channel and the
		1, 2	other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1113	040	
T1	S	10	

Table A.4.5.2.4.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	FDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	Not Applicable
	Config 2,5		TDDConf.1.1	TDDConf.1.1
	Config 3,6		TDDConf.2.1	TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
Initial BWP	Config 1,4		DLBWP.0.1	DLBWP.0.1
Configuration	Config 2,5		DLBWP.0.1	DLBWP.0.1
	Config 3,6		DLBWP.0.1	DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1	DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1	DLBWP.1.1
	Config 3,6		DLBWP.1.1	DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1	ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1	ULBWP.0.1
	Config 3,6		ULBWP.0.1	ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1	ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1	ULBWP.1.1
	Config 3,6		ULBWP.1.1	ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD	-
measurement channel	Config 2,5		SR.1.1 TDD	-
	Config 3,6		SR2.1 TDD	-
RMSI CORESET	Config 1,4		CR.1.1 FDD	CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD	CR.1.1 TDD
	Config 3,6		CR2.1 TDD	CR2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR2.1 TDD	CCR2.1 TDD

TRS configuration	Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD
-	Config 2,5		TRS.1.1 TDD	TRS.1.1 TDD
	Config 3,6		TRS.1.1 TDD	TRS.1.1 TDD
OCNG Patterns			OP.1	OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1
-	Config 3,6		SSB.2 FR1	SSB.2 FR1
SMTC Configuration	-		SMTC.1	SMTC.1
TCI state			TCI.State.0	TCI.State.0
Correlation Matrix and	Antenna		1x2 Low	1x2 Low
Configuration				
EPRE ratio of PSS to SS	S			
EPRE ratio of PBCH DMI	RS to SSS	7		
EPRE ratio of PBCH to P	BCH DMRS	1		
EPRE ratio of PDCCH DMRS to SSS		1	0	0
EPRE ratio of PDCCH to PDCCH DMRS		dB		
EPRE ratio of PDSCH DMRS to SSS		1		
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
	EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Noc <sup>Note 2</sup>		dBm/15	-104	-104
		kHz	-104	
SS-RSRP Note 3		dBm/15	0.7	0.7
		kHz	-87	-87
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	17
Ês/Noc		dB	17	17
Io <sup>Note3</sup>	0 " 1015	dBm/	57.0	-57.9
	Config 1,2,4,5	9.36MHz	-57.9	
	0 " 00	dBm/	-1.0	
	Config 3,6	38.16MHz	-51.8	-51.8
Time offset to cell1 Note 4		ms	3	3
Time offset to cell2 Note 5		μS	-	3
Propagation Condition		•	AWGN	AWGN
1 - 3			-	-

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
- Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

#### A.4.5.2.4.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1 and Table A.4.5.2.4.2-2.

Table A.4.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table A.4.5.2.4.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1ms + SMTC duration subframes for synchronous intraband EN-DC, or 2 subframes for asynchronous interband EN-DC.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.2.5 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

#### A.4.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS38.133 section 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.5.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.5.1-2 and A.4.5.2.5.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.5.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations

Config	Description		
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to be tested in one of the supported test configurations			

Table A.4.5.2.5.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1 2	One is E-UTRAN RF channel and the
		1, 2	other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
ld		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.4.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range	Frequency Range		FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6	1	TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5	1	TDDConf.1.1
	Config 3,6	1	TDDConf.2.1
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2,5	1	10: N <sub>RB,c</sub> = 52
	Config 3,6	1	40: N <sub>RB,c</sub> = 106
Initial DL BWP	Config 1,4		DLBWP.0.1
Configuration	Config 2,5	1	DLBWP.0.1
	Config 3,6	1	DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1
	Config 3,6	1	ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1
	Config 3,6	1	ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5	1	SR.1.1 TDD
	Config 3,6	1	SR2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5	]	CR.1.1 TDD
	Config 3,6	]	CR2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5	]	CCR.1.1 TDD
	Config 3,6	]	CCR2.1 TDD

Config 2,5	TRS configuration	Config 1,4		TRS.1.1 FDD
OCNG Patterns         OP.1           SMTC Configuration         SMTC.1           TCI state         TCI.State.0           SSB Configuration         Config 1,2,4,5         SSB.1 FR1           Correlation Matrix and Antenna         1x2 Low           Configuration         1x2 Low           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PDCH to PDCH DMRS           EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         dBm/15 kHz           SS-RSRP Note 3         dBm/15 kHz           Es/lot         dB         17           Ēs/lot         dB         17           Ēs/Noc         dB         17           IoNote3         Config 1,2,4,5         dBm/9 sa(HbHz)           Config 3,6         dBm/9 sa(HbHz)         -57.9           Time offset to cell¹ Note 4         μs         33           Propagation Condition         AWGN		Config 2,5		TRS.1.1 TDD
SMTC Configuration         SMTC.1           TCI state         TCI.State.0           SSB Configuration         Config 1,2,4,5         SSB.1 FR1           Correlation Matrix and Antenna         1x2 Low           Configuration         1x2 Low           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH           EPRE ratio of PDSCH to PDSCH         BPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         AHz           EPRE ratio of OCNG to OCNG bMRS (Note 1)         AHz           Ey/lot         dBm/15 kHz           Es/lot         dB         17           Es/Noc         dB         17           IoNote3         Config 1,2,4,5         9.36MHz           Config 3,6         dBm/         -51.8           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN		Config 3,6		TRS.1.1 TDD
TCI state	OCNG Patterns			OP.1
SSB Configuration	SMTC Configuration			SMTC.1
Config 3,6   SSB.2 FR1	TCI state			TCI.State.0
Correlation Matrix and Antenna         1x2 Low           Configuration         EPRE ratio of PSS to SSS           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH bDRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDSCH bDRS to SSS         EPRE ratio of PDSCH bDRS to SSS           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)           EPRE ratio of OCNG DMRS (Note 1)         EPRE ratio of OCNG box (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         dBm/15 kHz           ES-RSRP Note 3         dBm/15 kHz           Es/lot         dB         17           Ēs/Noc         dB         17           IoNote3         dBm/ 9.36MHz         -57.9           Config 3,6         dBm/ 38.16MHz         -51.8           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN	SSB Configuration	Config 1,2,4,5		SSB.1 FR1
Configuration           EPRE ratio of PSS to SSS           EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PBCH to PBCH DMRS           EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH DMRS           EPRE ratio of PDSCH to PDCCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of PDSCH to PDSCH           BPRE ratio of PDSCH to PDCCH DMRS           BPRE ratio of PDSCH to PDSCH           BPRE ratio of PDSCH to PDSCH           BPRE ratio of PDSCH to PDSCH           BPRE ratio of PDSCH to PDSCH <td>· ·</td> <td>Config 3,6</td> <td></td> <td>SSB.2 FR1</td>	· ·	Config 3,6		SSB.2 FR1
EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PDCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)           EPRE ratio of OCNG DMRS to SSS(Note 1)         AHZ           ES-RSRP Note 3         dBm/15 kHz           Es/Noc         dB         17           Es/Noc         dB         17           Io Note3         Config 1,2,4,5         dBm/ 9.36MHz         -57.9           Config 3,6         dBm/ 38.16MHz         -51.8           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN	Correlation Matrix and			
EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PDCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)           EPRE ratio of OCNG DMRS to SSS(Note 1)         AHZ           ES-RSRP Note 3         dBm/15 kHz           Es/Noc         dB         17           Es/Noc         dB         17           Io Note3         Config 1,2,4,5         dBm/ 9.36MHz         -57.9           Config 3,6         dBm/ 38.16MHz         -51.8           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN	Configuration			
EPRE ratio of PBCH to PBCH DMRS         BPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH DMRS         dB           EPRE ratio of PDSCH DMRS to SSS         BPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)         BPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         dBm/15 kHz           SS-RSRP Note 3         dBm/15 kHz           Es/lot         dB         17           Es/Noc         dB         17           Io Note3         Config 1,2,4,5         dBm/9,36MHz         -57.9           Config 3,6         dBm/3,816MHz         -51.8           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN		3		
EPRE ratio of PDCCH DMRS to SSS         dB         0           EPRE ratio of PDCCH to PDCCH DMRS         dB         0           EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH         6           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG to OCNG DMRS (Note 1)         -104           EPRE ratio of OCNG to OCNG DMRS (Note 1)         6         -104           SS-RSRP Note 3         dBm/15 kHz         -87           Es/Not         dB         17           Es/Noc         dB         17           IoNote3         Config 1,2,4,5         dBm/9.36MHz           Config 3,6         dBm/38.16MHz         -57.9           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN	EPRE ratio of PBCH DMR	RS to SSS		
## BPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)   BPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of PDSCH to PDSCH  ### ABM/15  ### ### ABM/15  ### A	EPRE ratio of PBCH to PE	BCH DMRS		
EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH         EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG to OCNG DMRS (Note 1)         ABm/15 kHz         SS-RSRP Note 3         Besilian of Constance of	EPRE ratio of PDCCH DM	IRS to SSS		
EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           NocNote 2         dBm/15 kHz         -104           SS-RSRP Note 3         dBm/15 kHz         -87           Ês/lot         dB         17           Ês/Noc         dB         17           IoNote3         Config 1,2,4,5         dBm/9.36MHz           Config 3,6         dBm/38.16MHz         -51.8           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN			dB	0
EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG to OCNG DMRS (Note 1)         Noc Note 2         dBm/15 kHz         -87         Ês/lot       dB       17         Ês/Noc       dB       17         Io Note3       Config 1,2,4,5       dBm/ 9.36MHz       -57.9         Config 3,6       dBm/ 38.16MHz       -51.8         Time offset to cell1 Note 4       μs       33         Propagation Condition       AWGN				
EPRE ratio of OCNG to OCNG DMRS (Note 1)           Noc Note 2         dBm/15 kHz         -104           SS-RSRP Note 3         dBm/15 kHz         -87           Ês/lot         dB         17           Ēs/Noc         dB         17           IoNote3         Config 1,2,4,5         dBm/9.36MHz           Config 3,6         dBm/9.38.16MHz         -57.9           Time offset to cell1 Note 4         μs         33           Propagation Condition         AWGN				
Noc Note 2		` ,		
KHz		CNG DMRS (Note 1)		
SS-RSRP Note 3    ABm/15   RHz   RHz	N <sub>oc</sub> Note 2			-104
kHz       -87         Ēs/lot       dB       17         Ēs/Noc       dB       17         IoNote3       Config 1,2,4,5       dBm/ 9.36MHz       -57.9         Config 3,6       dBm/ 38.16MHz       -51.8         Time offset to cell1 Note 4       μs       33         Propagation Condition       AWGN				
Es/Iot       dB       17         Es/Noc       dB       17         IoNote3       Config 1,2,4,5       dBm/ 9.36MHz       -57.9         Config 3,6       dBm/ 9.36MHz       -51.8         Time offset to cell1 Note 4       μs       33         Propagation Condition       AWGN	SS-RSRP Note 3		dBm/15	-87
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			kHz	01
			dB	17
	Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Config 3,6       38.16MHz       -51.8         Time offset to cell1 Note 4       μs       33         Propagation Condition       AWGN	Io <sup>Note3</sup>	Config 1,2,4,5		-57.9
Propagation Condition AWGN				-51.8
1 0	Time offset to cell1 Note 4		μS	33
1 0	Propagation Condition			AWGN
TNOTE T. OCNO SHAILDE USEU SUCH THAT DOTH CEITS ARE TUITY AHOCATED AND A CONSTANT TOTAL HANSMITTEN DOWER		be used such that be	oth cells are fully alloca	

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

#### A.4.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.5.2-1 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table A.4.5.2.3.2-1 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

Table A.4.5.2.5.2-1: Interruption length X and Y at measurements on deactivated E-UTRA SCC

и	NR Slot	Interruption length X slot	Interruption length Y slot
	length (ms)	Sync	

0	1	1	1
1	0.5	1	1

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.2.6 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

#### A.4.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 section 8.2.1. Supported test configurations are shown in table A.4.5.2.6.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.6.1-1 and A.4.5.2.6.1-2 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.6.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations

Config Description		Description		
1		LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
	3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4 LTE TDD, NI		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5 LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD de		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
6 LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, T		LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note:	Note: The UE is only required to be tested in one of the supported test configurations			

Table A.4.5.2.6.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and two is
		1, 2	NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on E-UTRAN RF channel number
			1.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		011	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.4.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range	Frequency Range		FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106
Initial DL BWP	Config 1,4		DLBWP.0.1
Configuration	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5		SR.1.1 TDD
	Config 3,6		SR2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD
	Config 3,6	<u> </u>	CR2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD

	Config 3,6		CCR2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5	<b>1</b>	TRS.1.1 TDD
	Config 3,6	1	TRS.1.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6	1	SSB.2 FR1
Correlation Matrix and A	ntenna		1x2 Low
Configuration			
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS	to SSS	1	
EPRE ratio of PBCH to PBC	CH DMRS		
EPRE ratio of PDCCH DMR			
EPRE ratio of PDCCH to PI		dB	0
EPRE ratio of PDSCH DMR			
EPRE ratio of PDSCH to PD		_	
EPRE ratio of OCNG DMRS	, ,		
EPRE ratio of OCNG to OC	NG DMRS (Note 1)	1	
N <sub>oc</sub> Note 2		dBm/15	-104
OO DODD Note 2		kHz	
SS-RSRP Note 3		dBm/15	-87
		kHz	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/ 9.36MHz	-57.9
	Config 3,6	dBm/ 38.16MHz	-51.8
Time offset to cell1 Note 4		μS	500
Propagation Condition		· ·	AWGN
	e used such that bo	th cells are fully	allocated and a constant total transmitted power
	ty is achieved for al	•	•
-	•	•	of specified in the test is assumed to be constant over

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

### A.4.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1 and Table A.4.5.2.4.2-2.

## Table A.4.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table A.4.5.2.6.2-2: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

The rate of correct events observed during repeated tests shall be at least 90%.

#### A.4.5.2.7 Void

### A.4.5.3 SCell Activation and Deactivation Delay

# A.4.5.3.1 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160ms SCell measurement cycle

#### A.4.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in section 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.4.5.3.1.1-1 below. The test parameters are given in Tables A.4.5.3.1.1-2 and cell-specific parameters in A.4.5.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot  $(m+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ , as defined in section 8.3. The UE shall start reporting CSI in PSCell in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell or PSCell interruption due to activation of SCell shall occur in the slot  $(m+1+[T_{HARQ}])$  to  $(m+1+[T_{HARQ}+3m+T_{SMTC\_MAX}+T_{SMTC\_duration}])$ , as defined in section 8.3.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in section 8.3, and any PCell and PSCell interruption due to the deactivation shall occur in the slot  $(n+1+[T_{HARQ}+3ms])$  to  $(n+1+[T_{HARQ}+3ms])$ , as defined in section 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.4.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is	s only required to be tested in one of the supported test configurations

Table A.4.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in section A.3.7.2.1
Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
Configured deactivated SCell		Cell 3	Configured deactivated secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every second subframe
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	μS	0	
Time alignment error between cell3 and cell2	μS	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	S	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	S	1	During this time the UE shall activate the SCell.
Т3	S	1	During this time the UE shall deactivate the SCell.
Tharq	ms	k	k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [3]

Tcsl_Reporting	ms	2	the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]
k	ms	$k_1 + 3 \cdot N_{\mathrm{slot}}^{\mathrm{subframe}\mu} + 1$	As specified in section 4.3 of TS 38.213 [3]

Table A. 4.5.3.1.1-3: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	Cell 2 T1 T2 T3	Cell 3 T1 T2 T3
SSB ARFCN			freq1	freq1
	Config 1,4			FDD
Duplex mode	Config 2,3,5,6			TDD
	Config 1,4		Not A	pplicable
TDD configuration	Config 2,5		TDDConf.1.1	
	Config 3,6		TDD	Conf.2.1
	Config 1,4	10: N <sub>RB,c</sub> = 52		I <sub>RB.c</sub> = 52
BW <sub>channel</sub>	Config 2,5	MHz		I <sub>RB,c</sub> = 52
_ : :	Config 3,6			RB,c = 106
	Config 1,4			I <sub>RB,c</sub> = 52
BWP BW	Config 2,5	-		RB,c = 52
DWI DW	Config 3,6	+		
DBy Cyclo	Corning 3,0	ma		<sub>RB,c</sub> = 106
DRx Cycle	0 5 4 4	ms		applicable applicable
PDSCH Reference	Config 1,4		SR.1.1 FDD	SR.1.1 FDD
measurement channel	Config 2,5	-	SR.1.1 TDD	SR.1.1 TDD
	Config 3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET	Config 1,4	-	CR.1.1 FDD	CR.1.1 FDD
Reference Channel	Config 2,5	_	CR.1.1 TDD	CR.1.1 TDD
- Troiding Griding	Config 3,6		CR.2.1 TDD	CR.2.1 TDD
RMC CORESET	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
Reference Channel	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
Reference Charmer	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD
	Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD
TRS configuration	Config 2,5		TRS.1.1 TDD	TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD	TRS.1.2 TDD
OCNG Patterns			(	OP.1
SMTC configuration			SMTC.1	
<u> </u>	Config 1,2,4,5			3.1 FR1
SSB configuration	Config 3,6	†		B.2 FR1
PDSCH/PDCCH	Config 1,2,4,5	1	15 kHz	
subcarrier spacing	Config 3,6	kHz	30kHz	
EPRE ratio of PSS to SSS	, · · · · · · · · · · · · · · · · · · ·			
EPRE ratio of PBCH DMRS	S to SSS	1		
EPRE ratio of PBCH to PB				
EPRE ratio of PDCCH DMI	RS to SSS	1		
EPRE ratio of PDCCH to P		dB		0
EPRE ratio of PDSCH DMRS to SSS		_		
EPRE ratio of PDSCH to PDSCH		1		
EPRE ratio of OCNG DMR				
EPRE ratio of OCNG to OC	UNIKO (NOTE 1)			
$N_{oc}^{$		dBm/15kHz	·	-104
∧/ Note2	Config 1,2,4,5			-104
$N_{oc}^{$ Note2	Config 3,6	dBm/SCS	-101	

$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	17	
$\hat{E}_s/N_{oc}$		dB	17	
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5	dBm/SCS	-87	
	Config 3,6	ubili/SCS	-84	
SCH_RP Note 3		dBm/15 kHz	-87	
Propagation condition		-	AWGN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{-}$  to be fulfilled.
- Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

### A.4.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in a slot (m+k), or in a slot  $(m+1+[T_{HARQ}+3ms+T_{SSB\_max}+T_{SMTC\_duration}]+1)$  as defined in section 8.3 if the slot (m+k) was subject to interruption. Whether CSI report in slot (m+k) was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot (m+T<sub>HARO</sub>+T<sub>activation time</sub>+T<sub>CSI Reporting</sub>), T<sub>activation time</sub> = [T<sub>SMTC SCell</sub>+5ms], as defined in section 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in section 8.3

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot  $(m+1+[T_{HARQ}])$  to  $(m+1+[T_{HARQ}+3ms+T_{SMTC\_max}+T_{SMTC\_duration}])$ , as defined in section 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot  $(n+1+[T_{HARQ}])$  to  $(n+1+[T_{HARQ}+3ms])$ , as defined in section 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in Section 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (m+T<sub>HARQ</sub>+T<sub>activation\_time</sub>+T<sub>CSI\_Reporting</sub>) as defined in section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

# A.4.5.3.2 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 320 ms SCell measurement cycle

#### A.4.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in section A.4.5.3.1.1. The supported test configurations are the same as defined in section A.4.5.3.1.1. The test parameters are the same except those described in the following section. The listed parameter values in Tables A.4.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2.

## Table A.4.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 320 ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle (measCycleSCell)	ms	320	

#### A.4.5.3.2.2 Test Requirements

The test requirements defined in section A.4.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [ $T_{SMTC\_MAX} + T_{SMTC\_SCell} + 5ms$ ].

#### A.4.5.3.3 SCell Activation and deactivation of unknown SCell in FR1 in non-DRX

#### A.4.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in section 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are the same as defined in section A.4.5.3.1.1. The test parameters are the same except those described in the following section. The listed parameter values in Tables A.4.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment [100ms] after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of cell 3 is increased to same level as for cell 2. The UE shall be able to report valid CSI for the activated SCell at latest in slot  $(m+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$  as defined in section 8.3 provided the SCell can be successfully detected on the first attempt. The UE shall start reporting CSI in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(m+1+[T_{HARQ}])$  to  $(m+1+[T_{HARQ}+3ms+T_{SMTC\_MAX}+T_{SMTC\_MAX}+T_{SMTC\_Max}+T_$ 

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell at latest in slot  $(n+[T_{HARQ}+3ms])$  as defined in section 8.3, and any PCell and PSCell interruption due to the deactivation shall occur in the  $(n+1+[T_{HARQ})]$  to  $(n+1+[T_{HARQ}+3ms])$  as defined in section 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CQI reporting for SCell1 is discontinued.

Table A.4.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

	Parameter	Unit	Value	Comment
ſ	T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

### A.4.5.3.3.2 Test Requirements

The test requirements defined in section A.4.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $[2*T_{SMTC\_MAX}+2*T_{SMTC\_SCell}+5ms]$  as defined in section 8.3.

#### A.4.5.3.4 Void

### A.4.5.4 UE UL carrier RRC reconfiguration Delay

### A.4.5.4.1 UE UL carrier RRC reconfiguration Delay

#### Table A.4.5.4.1-1 - Table A.4.5.4.1-4: Void

#### A.4.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in section 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test parameters for PSCell and SCell are given in Table A. 4.5.4.1.1-1, Table A. 4.5.4.1.1-2, Table A. 4.5.4.1.1-3 and Table A. 4.5.4.1.1-4 below. The test parameters and applicability for E-UTRAN PCell are defined in A.3.7.2. The test consists two tests. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 3 is configured to UE. At the start of T2, a supplementary uplink of cell3 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 3 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.4.5.4.1.1-1: Supported test configurations

Configuration	PSCell (Cell2)	SCell (Cell3)
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode
2	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode
3	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode
4	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode;

		SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode		
5	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode		
6	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode		
7	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode		
8	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode		
9	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode		
Note: The UE is only required to be tested in one of the supported test configurations				

Table A.4.5.4.1.1-2: General test parameters for EN-DC UE UL carrier RRC reconfiguration Delay

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1,2,3, 4, 5, 6, 7, 8, 9	1, 2, 3	Three radio channels are used for these two tests.
Active cell		Config 1,2,3, 4, 5, 6, 7, 8, 9	Cell 1: E-UTRAN PCell Cell 2: FR1 PSCell Cell 3: FR1 SCell	E-UTRAN PCell on RF channel number 1 FR1 PSCell on RF channel number 2 FR1 SCell on RF channel number 3
CP length		Config 1,2,3, 4, 5, 6, 7, 8, 9	Normal	
DRX		Config 1,2,3, 4, 5, 6, 7, 8, 9	OFF	
Measurement gap pattern Id		Config 1,2,3, 4, 5, 6, 7, 8, 9	OFF	
Filter coefficient		Config 1,2,3, 4, 5, 6, 7, 8, 9	0	L3 filtering is not used
T1	S	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	
T2	S	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	
T3	S	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	

Table A.4.5.4.1.1-3: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on PSCell (Cell 2)

Parameter	Unit	Test		Test 1		Test 2				
		Configuration	T1	T1 T2 T3			T2	T3		
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		2		2				
		Conf 1, 2, 3		N/A			N/A			
TDD configuration		Conf 4, 5, 6		ΓDD Conf.1	.1	TDD Conf.1.1				
		Conf 7, 8, 9		ΓDD Conf.2	.1	TDD Conf.2.1				

_		T		
		Conf 1, 2, 3	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	MHz	Conf 4, 5, 6	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
		Conf 7, 8, 9	40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
PDSCH reference		Conf 1, 2, 3	SR.1.1 FDD	SR.1.1 FDD
measurement		Conf 4, 5, 6	SR.1.1 TDD	SR.1.1 TDD
channel as defined		Conf 7, 8, 9	SR 2.1 TDD	SR 2.1 TDD
in A.3.1.1				_
RMSI CORESET		Conf 1, 2, 3	CR.1.1 FDD	CR.1.1 FDD
reference		Conf 4, 5, 6	CR.1.1 TDD	CR.1.1 TDD
measurement		Conf 7, 8, 9	05.0.1.555	
channel as defined			CR.2.1 TDD	CR.2.1 TDD
in A.3.1.2		0 (4 0 0	000 4 4 500	000 4 4 500
RMC CORESET		Conf 1, 2, 3	CCR.1.1 FDD	CCR.1.1 FDD
reference		Conf 4, 5, 6	CCR.1.1 TDD	CCR.1.1 TDD
measurement		Conf 7, 8, 9	000 04 700	000 0 4 700
channel as defined			CCR.2.1 TDD	CCR.2.1 TDD
in A.3.1.3		0 (4 0 0 4		
OCNG Pattern Note 1		Conf 1, 2, 3, 4,	OP.1	OP.1
	1	5, 6, 7, 8, 9		
000 #		Conf 1, 2, 3, 4,	SSB.1 FR1	SSB.1 FR1
SSB configuration		5, 6	000 0 504	000 0 504
		Conf 7, 8, 9	SSB.2 FR1	SSB.2 FR1
SMTC configuration		Conf 1, 2, 3, 4,	SMTC.1	SMTC.1
_		5, 6, 7, 8, 9		
DL initial BWP		Conf 1, 2, 3, 4,	DLBWP.0.1	DLBWP.0.1
configuration		5, 6, 7, 8, 9	-	-
DL dedicated BWP		Conf 1, 2, 3, 4,	DLBWP.1.1	DLBWP.1.1
configuration		5, 6, 7, 8, 9		
UL dedicated BWP		Conf 1, 2, 3, 4,	ULBWP.1.1	ULBWP.1.1
configuration		5, 6, 7, 8, 9		
EPRE ratio of PSS				
to SSS				
EPRE ratio of				
PBCH_DMRS to				
SSS EPRE ratio of PBCH				
to PBCH_DMRS				
EPRE ratio of				
PDCCH_DMRS to SSS				
EPRE ratio of				
PDCCH to				
	dB	Conf 1, 2, 3, 4,	0	0
PDCCH_DMRS	uБ	5, 6, 7, 8, 9	U	0
EPRE ratio of PDSCH_DMRS to				
SSS	]			
EPRE ratio of	1			
PDSCH to	]			
PDSCH_DMRS	]			
EPRE ratio of	1			
OCNG DMRS to	]			
SSS				
EPRE ratio of	1			
OCNG to OCNG				
DMRS	]			
DIVINO	dBm /	Conf 1, 2, 3, 4,	-102	-102
	15kHz	5, 6, 7, 8, 9	- 102	-102
<b>37</b> . W		Conf	-102	-102
$N_{oc}$ Note 2	dBm/	1,2,3,4,5,6	.02	.02
	SCS	Conf 7,8,9	-99	-99
		, - , -		

$\hat{E}_s/N_{oc}$	dB Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		16	16	16	16	16	16	
$\hat{E}_{_{s}}/I_{_{ot}}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16	
SS-RSRP Note 3	RSRP Note 3		-86	-86	-86	-86	-86	-86	
	SCS	Conf 7,8,9	-83	-83	-83	-83	-83	-83	
	dBm/ 9.36 MHz	Conf 1,2,3,4,5,6	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9	
Io Note 3	dBm/ 38.16 MHz	Conf 7,8,9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8	
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN			
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2 1 x 2			

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

NOTE 3:  $\hat{E}_{_{s}}/I_{_{ot}}$ , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.4.5.4.1.1-4: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on SCell (Cell 3)

Parameter	Unit	Test		Test 1			Test 2			
		Configuration	T1	<b>T2</b>	Т3	T1	T2	Т3		
Channel number		Conf 1, 2, 3, 4,		3		3				
		5, 6, 7, 8, 9								
		Conf 1, 4, 7		N/A			N/A			
TDD configuration		Conf 2, 5, 8		TDDConf.1	.1		TDDConf.1.1			
		Conf 3, 6, 9		TDDConf.2	.1		TDDConf.2.1			
		Conf 1, 4, 7		10: $N_{RB,c} = 5$	52		10: $N_{RB,c} = 52$			
BW <sub>channel</sub>	MHz	Conf 2, 5, 8		10: N <sub>RB,c</sub> = 5	52		10: $N_{RB,c} = 52$			
		Conf 3, 6, 9		$40: N_{RB,c} = 1$	06		40: $N_{RB,c} = 106$	5		
		Conf 1, 4, 7	G- FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	N/A		
PUSCH parameters for NR UL carrier		Conf 2, 5, 8	G- FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	N/A		
		Conf 3, 6, 9	G- FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	N/A	G-FR1- A3-7 in [13]	N/A		
PUCCH parameters		Conf 1, 4, 7	Table 8.3.3.1 .2-1 in [13]	Table 8.3.3.1. 2-1 in [13]	Table 8.3.3.1.2 -1 in [13]	N/A	N/A	N/A		
For NR UL carrier		Conf 2, 5, 8	Table 8.3.3.1 .2-1 in [13]	Table 8.3.3.1. 2-1 in [13]	Table 8.3.3.1.2 -1 in [13]	N/A	N/A	N/A		

					•		•	
		Conf 3, 6, 9	Table	Table	Table			
			8.3.3.1	8.3.3.1.	8.3.3.1.2	N/A	N/A	N/A
			.2-2 in	2-2 in		IN/A	IN/A	IN/A
			[13]	[13]	-2 in [13]			
		Conf 1, 4, 7		G-FR1-		G-FR1-	G-FR1-	G-FR1-
		, ,	N/A	A3-3 in	N/A	A3-3 in	A3-3 in	A3-3 in
				[13]		[13]	[13]	[13]
PUSCH parameters		Conf 2, 5, 8		G-FR1-		G-FR1-	G-FR1-	G-FR1-
for supplementary		COIII 2, 3, 0	N/A	A3-3 in	N/A	A3-3 in	A3-3 in	A3-3 in
UL			13/7		IN/A	[13]		[13]
l or		0		[13]			[13]	
		Conf 3, 6, 9	N1/A	G-FR1-	N1/A	G-FR1-	G-FR1-	G-FR1-
			N/A	A3-7 in	N/A	A3-7 in	A3-7 in	A3-7 in
				[13]		[13]	[13]	[13]
		Conf 1, 4, 7				Table	Table	Table
			N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
						-1 in [13]	-1 in [13]	-1 in [13]
DUCCH parameters		Conf 2, 5, 8				Table	Table	Toblo
PUCCH parameters			N1/A	N1/A	N1/A	Table	8.3.3.1.2	Table
for supplementary			N/A	N/A	N/A	8.3.3.1.2	-1 in	8.3.3.1.2
UL						-1 in [13]	[13]	-1 in [13]
		Conf 3, 6, 9				Table	Table	Table
		00111 3, 0, 3	N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
			18/7	13/7	IN/A			
DD00H ==f=====		0		00 4 4 50	<u> </u>	-2 in [13]   -2 in [13]   -2 in [13]		
PDSCH reference		Conf 1, 4, 7		SR.1.1 FD		SR.1.1 FDD		
measurement		Conf 2, 5, 8	SR.1.1 TDD			SR.1.1 TDD		
channel as defined		Conf 3, 6, 9		SR 2.1 TD	D		SR 2.1 TDD	1
in A.3.1.1								
RMSI CORESET		Conf 1, 4, 7		CR.1.1 FD	D		CR.1.1 FDD	
reference		Conf 2, 5, 8		CR.1.1 TD	D		CR.1.1 TDD	)
measurement		Conf 3, 6, 9						
channel as defined			CR.2.1 TDD				CR.2.1 TDD	)
in A.3.1.2			011.211 133					
RMC CORESET		Conf 1, 4, 7	CCR.1.1 FDD			(	CR.1.1 FDI	)
reference		Conf 2, 5, 8		CCR.1.1 TE			CR.1.1 TDI	
measurement		Conf 3, 6, 9	· `	JOIN. 1. 1 1L	JU	CCIX.1.1 TDD		
		Con 3, 6, 9	١,	CCR.2.1 TI	20	CCR.2.1 TDD		
channel as defined			١	JCR.2.1 11	טט	CCR.2.1 IDD		
in A.3.1.3		0 (4 0 0		00.4		05.4		
OCNG Pattern Note 1		Conf 1, 2, 3		OP.1		OP.1		
		Conf 1, 2, 4, 5,		SSB.1 FR	1	SSB.1 FR1		
SSB configuration		7,8						
		Conf 3, 6, 9		SSB.2 FR	1		SSB.2 FR1	
CMTC configuration		Conf 1, 2, 3, 4,		CMTC 4	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	SMTC.1	·
SMTC configuration		5, 6, 7, 8, 9		SMTC.1			SIVITU. I	
DL initial BWP		Conf 1, 2, 3, 4,			_			
configuration		5, 6, 7, 8, 9		DLBWP.0.	.1		DLBWP.0.1	
DL dedicated BWP		Conf 1, 2, 3, 4,						
configuration		5, 6, 7, 8, 9		DLBWP.1.	.1		DLBWP.1.1	
UL dedicated BWP	1	Conf 1, 2, 3, 4,						
			ULBWP.1.1				ULBWP.1.1	
configuration		5, 6, 7, 8, 9	223					
EPRE ratio of PSS								
to SSS								
EPRE ratio of								
PBCH_DMRS to								
SSS	-15	Conf 1, 2, 3, 4,					6	
EPRE ratio of PBCH	dB	5, 6, 7, 8, 9		0			0	
to PBCH_DMRS		_, _, ., ., .						
EPRE ratio of								
PDCCH_DMRS to								
SSS		l						

EPRE ratio of PDCCH to PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS						_		
	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		-102		-102		
$N_{oc}$ Note 2	dBm/ SCS	Conf 1, 2, 4, 5, 7,8		-102			-102	
	000	Conf 3, 6, 9	-99			-99		
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_{_{s}}/I_{_{ot}}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-86	-86	-86	-86	-86	-86
	303	Conf 3, 6, 9	-83	-83	-83	-83	-83	-83
Io Note 3	dBm/ 9.36 MHz	Conf 1, 2, 4, 5, 7,8	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
	dBm/ 38.16 MHz	Conf 3, 6, 9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN		
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		1 x 2 1 x 2				

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

NOTE 3:  $\hat{E}_{_{s}}/I_{_{ot}}$ , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.4.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within [20]ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within [20]ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within [20]ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within [20]ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

### A.4.5.5 Beam Failure Detection and Link recovery procedures

# A.4.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

#### A.4.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.1.1-1, A.4.5.5.1.1-2, A.4.5.5.1.1-3 and A.4.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.4.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.4.5.5.1.1-1: Supported test configurations for FR1 PCell

Configuration	Description					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note: The UE is only required to pass in one of the supported test configurations in FR1						

Table A.4.5.5.1.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter			Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell	Active PSCell			
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	

	Config 2, 5		10: NRB,c = 52	
	-			
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4 Config 2, 5 Config 3, 6	- -	Not Applicable TDDConf.1.1 TDDConf.1.2	
CORESET Reference Channel	Config 1, 4 Config 2, 5 Config 3, 6	-	CR. 1.1 FDD CR. 1.1 TDD CR. 2.1 TDD	
SSB Configuration	Config 1, 4 Config 2, 5 Config 3, 6	-	SSB.1 FR1 SSB.1 FR1 SSB.2 FR1	
SMTC Configuration	Config 1, 2, 4, 5 Config 3, 6		SMTC.1 SMTC.1	
PDSCH/PDCCH subcarrie spacing	Config 3, 6	-	15 KHz 30 KHz	
PRACH Configuration	Config 1, 2, 4, 5 Config 3, 6	_	Table A.3.8.2.4-1 Table A.3.8.2.4-1	
SSB Index assigned as BF	FD RS (q <sub>0</sub> )		0	
SSB Index assigned as CE	BD RS (q <sub>1</sub> )		1	
OCNG parameters			OP.1	
CP length Correlation Matrix and Ant	onno Configuration		Normal 2x2 Low	
Correlation Matrix and Ant	· ·		ZXZ LUW	
	DCI format		1-0	
Beam failure detection	Number of Control OFDM symbols		2	
transmission parameters	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average	dB	0	
	CSI-RS RE energy DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID		1	gp0	140
rlmInSyncOutOfSyncThres	snoid		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).

rsrp-ThresholdSSB		dBm	[-96]	Threshold used for
				$Q_{out\_LR\_SSB}$
powerControlOffsetSS			db0	Used for deriving
				rsrp-ThresholdCSI-
				RS
beamFailureInstanceMax	xCount		n2	see TS 38.321 [7],
				section 5.17
beamFailureDetectionTir	ner		pbfd4	see TS 38.321 [7],
			·	section 5.17
CSI-RS configuration	Config 1, 4		[CSI-RS.1.3 FDD]	
	Config 2, 5		[CSI-RS.1.3 TDD]	
	Config 3, 6		[CSI-RS.2.3 TDD]	
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]	
	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
T1		S	1	During this time the
				the UE shall be fully
				synchronized to cell 1
T2		S	0.4	
T3		S	[0.6]	
T4		S	[0.4]	
T5		S	[1.4]	
D1		S	[0.44]	
NI ( A AII C C	. 14 (1 11		0 0 0 0 1 1 1 7 4	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.4.5.5.1.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parai	meter	Unit			Test 1			Test 1				
				SS	B of se	t qo			SSB	of set	<b>q</b> 1	
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ratio of		dB										
DMRS to SSS												
EPRE ratio of		dB										
PDCCH DMRS												
EPRE ratio of	PBCH DMRS	dB										
to SSS												
EPRE ratio of	PBCH to	dB	dB									
	PBCH DMRS				0					0		
	EPRE ratio of PSS to SSS											
EPRE ratio of		dB										
DMRS to SSS												
EPRE ratio of		dB										
PDSCH DMRS												
EPRE ratio of	OCNG DMRS	dB										
to SSS	0	-ID	[6]		[ 40]	[ 40]	[ 40]	[ 40]	[ 40]	[ 40]		[7]
SNR	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
$N_{oc}$	Config 1	dBm/15	-98			-98						
- · oc	Config 2	KHz	-98			-98						
	Config 3			-98			-98					

Propagat	ion condition		TDLC300-100	TDLC300-100				
Note 1:	OCNG shall be used	such that	the resources in Cell 1 are fully alloca	ated and a constant total				
	transmitted power sp	ectral dens	sity is achieved for all OFDM symbols	S.				
Note 2:								
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of							
	time period T1.							
Note 4:								
Note 5:	The timers and layer	3 filtering	related parameters are configured pri	or to the start of time period T1.				
Note 6:	The signal contains	PDCCH for	UEs other than the device under tes	t as part of OCNG.				
Note 7:			ignal to noise ratio over the SSS REs					
Note 8:	The SNR in time per	iods T1, T2	2, T3, T4 and T5 is denoted as SNR1	, SNR2 and SNR3 respectively in				
	figure A.4.5.5.1.1-1.							
Note 9:			or testing a UE which supports 2RX o					
	a UE which supports	4RX on al	I bands, the SNR during T3 is [A.3.6]					

Table A.4.5.5.1.1-4: Measurement gap configuration for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Field	Test 2
rieid	Value
gapOffset	0

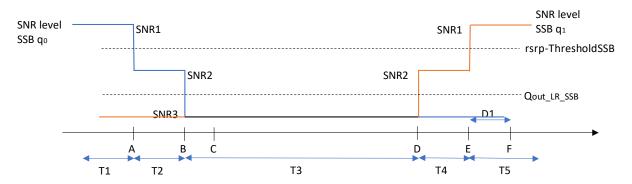


Figure A.4.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

### A.4.5.5.1.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

#### A.4.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.2.1-1, A.4.5.5.2.1-2, A.4.5.5.2.1-3, A.4.5.5.2.1-4 and A.4.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.4.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Configuration Description LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode 1 LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode 2 LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode 3 4 LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode 5 LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode 6 Note: The UE is only required to pass in one of the supported test configurations in FR1

Table A.4.5.5.2.1-1: Supported test configurations for FR1 PCell

Table A.4.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Num	nber		1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	

DL initial BWP configuration	on Config 1, 2, 3, 4,		DLBWP.0.1	
DE Illitial BVVI Cornigulatio	5, 6		DEBWY .U.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5 Config 3, 6		TDDConf.1.1 TDDConf.1.2	
CORESET Reference Channel	Config 1, 4 Config 2, 5		CR. 1.1 FDD CR. 1.1 TDD	
SSB Configuration	Config 3, 6 Config 1, 4		CR. 2.1 TDD SSB.1 FR1	
	Config 2, 5 Config 3, 6	-	SSB.1 FR1 SSB.2 FR1	
SMTC Configuration	Config 1, 2, 4, 5 Config 3, 6	_	SMTC.1 SMTC.1	
PDSCH/PDCCH subcarrie spacing			15 KHz	
PRACH Configuration	Config 3, 6 Config 1, 2, 4, 5		30 KHz Table A.3.8.2.4-1	
1 NACI1 Configuration	Config 3, 6	-	Table A.3.8.2.4-1	
SSB Index assigned as BF	· ·		0	
SSB Index assigned as CE			1	
OCNG parameters	X 1 /		OP.1	
CP length			Normal	
Correlation Matrix and Ant			2x2 Low	
	DCI format		1-0	
Beam failure detection	Number of Control OFDM symbols		2	
transmission parameters	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average	dB	0	
	CSI-RS RE energy DMRS precoder		REG bundle size	
	granularity REG bundle size		6	
DRX			DRX.7	A.3.3.7
Gap pattern ID			gp0	
rlmInSyncOutOfSyncThres	shold		absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB		dBm	[-96]	(Table 8.1.1-1). Threshold used for
1916-1111691101099D		UDIII	[-20]	Q <sub>out_LR_SSB</sub>

powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMax	xCount		n2	see TS 38.321 [7], section 5.17
beamFailureDetectionTir	ner		pbfd4	see TS 38.321 [7], section 5.17
CSI-RS configuration	Config 1, 4		[CSI-RS.1.3 FDD]	
-	Config 2, 5		[CSI-RS.1.3 TDD]	
	Config 3, 6		[CSI-RS.2.3 TDD]	
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]	
_	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	0.4	
T3		S	[0.6]	
T4	•	S	[0.4]	
T5		S	[1.4]	
D1		S	[0.44]	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.4.5.5.2.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

P	arameter	Unit	Test 1			Test 1						
				SSB of set q <sub>0</sub>				SSB	of set	<b>q</b> 1		
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ra	atio of PDCCH	dB										
DMRS to	o SSS											
	atio of PDCCH to	dB										
PDCCH												
_	atio of PBCH	dB										
DMRS to	o SSS											
_	atio of PBCH to	dB										
PBCH D					0					0		
_	atio of PSS to	dB			O					O		
SSS												
_	atio of PDSCH	dB										
DMRS to												
_	atio of PDSCH to	dB										
PDSCH												
	atio of OCNG	dB										
DMRS to												
SNR	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
$N_{oc}$	Config 1	dBm/15K		-98				-98				
- · oc	Config 2	Hz			-98					-98		
	Config 3			-98			-98					

Propagat	ion condition		TDLC300-100	TDLC300-100				
Note 1:	e 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total							
			ensity is achieved for all OFDM syml					
Note 2:			I reporting are assigned to the UE pri					
Note 3:	NZP CSI-RS res	source set co	onfiguration for CSI reporting are ass	igned to the UE prior to the start				
	of time period T	1.						
Note 4:			tion is assigned to the UE prior to the					
Note 5:	The timers and	layer 3 filteri	ng related parameters are configured	prior to the start of time period				
	T1.							
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.							
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.							
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3							
	respectively in f	espectively in figure A.4.5.5.1.1-1.						
Note 9:	The SNR values	s are specifie	ed for testing a UE which supports 2F	RX on at least one band. For				
	testing of a UE	which suppo	rts 4RX on all bands, the SNR during	73 is [A.3.6].				

Table A.4.5.5.2.1-4: Measurement gap configuration for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Field	Test 2
rieid	Value
gapOffset	[0]

Table A.4.5.5.2.1-5: DRX-Configuration for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode.

Field	Test 5	Test 6
Field	Value	Value
drx-onDurationTimer	[ms6]	[ms6]
drx-InactivityTimer	[ms1]	[ms1]
drx-	[sl1]	[sl1]
RetransmissionTimerDL		
drx-	[sl1]	[sl1]
RetransmissionTimerUL		
longDRX-	[ms640]	[ms40]
CycleStartOffset		
shortDRX	disable	disable

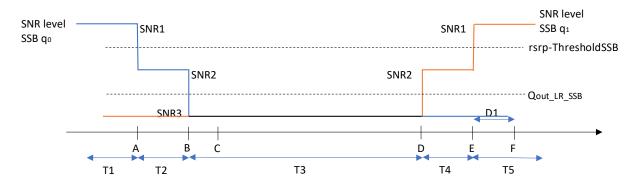


Figure A.4.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

### A.4.5.5.2.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.4.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.3.1-1, A.4.5.5.3.1-2, and A.4.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.3.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q<sub>0</sub> in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set q<sub>1</sub> of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.4.5.5.3.1-1: Supported test configurations for FR1 PSCell figuration

Description

Configuration	Description		
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to pass in one of the supported test configurations in FR1			

Table A.4.5.5.3.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Ī	Parameter	Unit	Value	Comment
			Test 1	

Active PCell			Cell 1	
RF Channel Numbe	r		1	
Duplex mode	Config 1, 4		FDD	
'	Config 2, 3, 5, 6		TDD	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
CORESET	Config 1, 4		CR.1.1 FDD	A.3.1.2
Reference	Config 2, 5		CR.1.1 TDD	
Channel	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3.10
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC	Config 1, 2, 4, 5		SMTC.1	A.3.11
Configuration	Config 3, 6		SMTC.1	
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz	
subcarrier spacing	Config 3, 6		30 KHz	
ani DO la dan anciona				
csi-RS-Index assign detection RS in set of			[0]	
OCNG parameters	10		OP.1	A.3.2.1
CP length			Normal	7.110.2.1
Correlation Matrix ar	nd Antenna		2x2 Low	
Configuration				
Beam failure	DCI format		1-0	
detection	Number of		2	
transmission	Control OFDM			
parameters	symbols			
	Aggregation level	CCE	8	
	Ratio of	dB	0	
	hypothetical			
	PDCCH RE			
	energy to average			
	CSI-RS RE			
	energy			
	Ratio of	dB	0	
	hypothetical			
	PDCCH DMRS			
	energy to average			
	CSI-RS RE			
	energy		DEO hamalla ai	
	DMRS precoder		REG bundle size	
	granularity REG bundle size		6	
	KEG bundle size		6	

DRX			OFF	
Gap pattern ID	)		N.A.	
	assigned as candidate		1	
beam detectio				
rlmInSyncOut	OfSyncThreshold		absent	When the field is
				absent, the UE
				applies the value 0.
	1000	- 15	1.001	(Table 8.1.1-1).
rsrp-Threshold	ISSB	dBm	[-96]	Threshold used for
	0#+00		ماله ٥	Q <sub>in_LR_SSB</sub>
powerControl	Jiiset55		db0	Used for deriving
				rsrp-ThresholdCSI- RS
heamFailureIn	stanceMaxCount		n2	see TS 38.321 [7],
bearin andrein	Stariociviaxoodiit		112	section 5.17
beamFailureD	etectionTimer		pbfd4	see TS 38.321 [7],
			r · ·	section 5.17
CSI-RS	Config 1, 4		CSI-RS.1.2 FDD	A.3.14
configuration	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
TRS	Config 1, 4		TRS.1.1 FDD	
configuration	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
T1		S	1	During this time the
				the UE shall be fully
				synchronized to cell
To		_	0.4	1
T2		S	0.4	
T3 T4		S	[0.6]	
T5		S	[0.4] [1.4]	
D1		S	[0.24]	
	-specific PDCCH is not tra		<u> </u>	
INOLE I. UE	-specific i Door is not tra	momilieu ai	וכו וו אמונא.	

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.4.5.5.3.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1							Test 1		
					-RS of se					-RS of se		
EDDE	(500		T1	T2	Т3	T4	T5	T1	T2	Т3	T4	T5
EPRE ratio of PSS to SSS		dB										
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ra to PBCH	tio of PBCH DMRS	dB										
EPRE ra PDCCH SSS	tio of DMRS to	dB										
EPRE ra PDCCH DMRS	tio of to PDCCH	dB			0					0		
	EPRE ratio of PDSCH DMRS to											
	EPRE ratio of PDSCH to PDSCH											
	tio of OCNG SSS <sup>(Note 1)</sup>	dB										
EPRE ra	tio of OCNG B DMRS (Note	dB										
SNR_C SI-RS	Config 1,	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[7]
	Config 2, 5		[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[7]
	Config 3,		[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[7]
$N_{oc}$	2		-98					-98				
			-98					-98				
	Config 3,				-98					-98		
Propaga condition	tion			TDL-	C 300ns 1	I00Hz			TDL-0	C 300ns 1	00Hz	
Note 1.	OCNC shall	I I	-ll- 4l-	-446		Call 4 a	المايال والما				4	

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

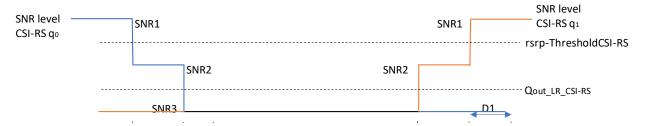


Figure A.4.5.5.3.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

#### A.4.5.5.3.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.4.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.4.1-1, A.4.5.5.4.1-2, A.4.5.5.4.1-3, and A.4.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.4.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.4.5.5.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description						
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode						
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode						
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
Note: The UE is only required to pass in one of the supported test configurations in FR1							

Table A.4.5.5.4.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter			Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
CORESET Reference	Config 1, 4		CR.1.1 FDD	A.3.1.2
Channel	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3.10
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	A.3.11
	Config 3, 6		SMTC.1	
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz	
subcarrier spacing	Config 3, 6		30 KHz	
csi-RS-Index assigned as to detection RS in set q <sub>0</sub>	peam failure		[0]	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	
Correlation Matrix and Ante	enna Configuration		2x2 Low	
Beam failure detection	DCI format		1-0	
transmission parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI- RS RE energy	dB	0	

	Ratio of	dB	0				
	hypothetical	ub	U				
	PDCCH DMRS						
	energy to						
	average CSI-						
	RS RE energy						
	DMRS precoder		REG bundle size				
	granularity		INEO buridie 3ize				
	REG bundle		6				
	size		O				
DRX	0120		DRX.7	A.3.3.7			
Gap pattern ID			*[gp0]	71.0.0.7			
csi-RS-Index assigned	as candidate heam		<u>[gpo]</u>				
detection RS in set q <sub>1</sub>	as candidate beam		I				
rlmInSyncOutOfSyncTh	reshold		absent	When the field is			
Illinioyneodioloynen	iresnoid		absent	absent, the UE			
				applies the value			
				0. (Table 8.1.1-1).			
rsrp-ThresholdSSB		dBm	[-96]	Threshold used for			
Torp Throundideed		abiii	[ 00]	Q <sub>in_LR_SSB</sub>			
powerControlOffsetSS			db0	Used for deriving			
powercontrolendesec			dbo	rsrp-ThresholdCSI-			
				RS			
beamFailureInstanceMa	axCount		[n2]	see TS 38.321 [7],			
	anount		[=]	section 5.17			
beamFailureDetectionT	ïmer		[pbfd4]	see TS 38.321 [7],			
			[[-0.0.]	section 5.17			
CSI-RS configuration	Config 1, 4		CSI-RS.1.2 FDD	A.3.14			
	Config 2, 5	1	CSI-RS.1.2 TDD				
	Config 3, 6	1	CSI-RS.2.2 TDD				
	Config 1, 4		TRS.1.1 FDD				
TRS configuration	Config 2, 5		TRS.1.1 TDD				
····garaman	Config 3, 6		TRS.1.2 TDD				
T1		S	1	During this time			
			'	the the UE shall be			
				fully synchronized			
				to cell 1			
T2		S	0.4	10 0011 1			
T3		S	[0.6]				
T4		S	[0.4]				
T5		S	[1.4]				
D1		S	[0.44]				
Note 1: UE-specific PDCCH is not transmitted after T1 starts.							
110.00 1. OL oposino i Doori is not transmitted arter 11 starte.							

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.4.5.5.4.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit			Test 1					Test 1		
					-RS of se					-RS of se		
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ratio of PSS		dB										
to SSS												
EPRE ra	tio of PBCH	dB										
DMRS to	SSS											
EPRE ra	tio of PBCH	dB										
to PBCH	DMRS											
EPRE ra	tio of	dB										
	DMRS to											
SSS												
EPRE ra		dB										
	to PDCCH											
DMRS					0					0		
EPRE ra		dB										
	DMRS to											
SSS												
EPRE ra		dB										
	to PDSCH											
DMRS												
	tio of OCNG	dB										
	SSS(Note 1)											
	tio of OCNG	dB										
to OCNG	DMRS (Note											
SNR_C	Config 1,4	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[7]
SI-RS	Config 2,5	"-	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[7]
-	Config 3,6	-	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[7]
2 "		dBm/	-98					-98				
$N_{oc}$	Config 2,5	15K	-98 -98				-98					
Config 3,6		Hz	-98					-98				
Propagation				TDL-0	C 300ns 1	00Hz		TDL-C 300ns 100Hz				
condition						-					•	
Note 1:	OCNG shal	l he used	d such th	at the res	ources in	Cell 1 a	e fully all	located a	nd a cons	stant total	transmitt	ed

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.4.5.5.4.1-4: Measurement gap configuration for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Field	Test 1		
rieid	Value		
gapOffset	[0]		

Table A.4.5.5.4.1-5: Void

Table A.4.5.5.4.1-6: Void

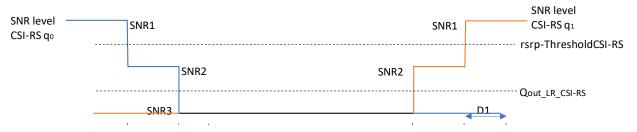


Figure A.4.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

### A.4.5.5.4.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.4.5.6 Active BWP switch delay

#### A.4.5.6.1 DCI-based and Timer-based Active BWP Switch

# A.4.5.6.1.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

#### A.4.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 section 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 section 7.32.2.7. Supported test configurations are shown in Table A.4.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.4.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.4.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PSCell's slot  $(i+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from slot  $(i+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

### During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at PSCell's slot  $(j+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from slot  $(j+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

Table A.4.5.6.1.1.1-1: DL BWP switch supported test configurations

Config Description						
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5 LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
6 LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
Note 1: The UE is only required to be tested in one of the supported test configurations.						
Note 2: A UE which fulfils t	he requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.					

Table A.4.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		-	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	G G	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	uБ	0	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A4.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Paran	neter	Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.1.2
BW <sub>channel</sub>	Config 1,4		10 MHz: N <sub>RB,c</sub> = 52
	Config 2,5		10 MHz: N <sub>RB,c</sub> = 52
	Config 3,6		40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID			1, 2
Initial DL BWP	Config 1,4		
Configuration	Config 2,5		DLBWP.0.2 Note 4
	Config 3,6		
Active DL BWP-1	Config 1,4		
Configuration	Config 2,5		DLBWP.1.1 Note 4
	Config 3,6		
Active DL BWP-2	Config 1,4		
Configuration	Config 2,5		DLBWP.1.3 Note 4
	Config 3,6		
Initial UL BWP	Initial UL BWP Config 1,4		
Configuration	Configuration Config 2,5		ULBWP.0.2 Note 4
	Config 3,6		
	Config 1,4		

	10 "	T	L Note 4
Active UL BWP-1	Config 2,5		ULBWP.1.1 Note 4
Configuration	Config 3,6		
Active UL BWP-2	Config 1,4		State 4
Configuration	Config 2,5		ULBWP.1.3 Note 4
	Config 3,6		
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
Dedicated CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns	, ,		OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
3	Config 3,6		SSB.2 FR1
SMTC Configuration	3 - 7 -		SMTC.1
Correlation Matrix and A	ntenna		1x2 Low
Configuration			
TRS Configuration	Config 1,4		TRS.1.1 FDD
3	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
EPRE ratio of PSS to SS		dB	0
EPRE ratio of PBCH DM			
EPRE ratio of PBCH to F			
EPRE ratio of PDCCH D			
EPRE ratio of PDCCH to			
EPRE ratio of PDSCH D			
EPRE ratio of PDSCH to			
EPRE ratio of OCNG DN			
1)	10 10 000(010		
EPRE ratio of OCNG to	OCNG DMRS		
(Note 1)			
N <sub>oc</sub> Note 2	Config 1,2,4,5	dBm/SCS	[-104]
	Config 3,6	_	[-101]
N <sub>oc</sub> Note 2	, 55g 5,6	dBm/15kH	[-104]
		Z	[]
SS-RSRP Note 3	Config 1,2,4,5	dBm/SCS	[-87]
	Config 3,6	1	[-90]
Ê <sub>s</sub> /I <sub>ot</sub>	1 Coming O,O	dB	[17]
Ê <sub>s</sub> /N <sub>oc</sub>		dB	[17]
Io <sup>Note3</sup>		dBm/	[-59]
	Config 1,2,4,5	9.36MHz	
			1 1 64 01
	Config 3,6	dBm/ 38.16MHz	[-61.9]
Propagation Condition	Config 3,6		AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

#### A.4.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelay}+k1)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Section 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

## A.4.5.6.1.2 E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC

#### A.4.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in section 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.4.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts.

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 1 UE-specific bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 3 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PSCell's slot  $(i+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from slot  $(i+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

#### During T3,

The time period T3 starts from the slot #j immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at PSCell's slot  $(j+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from slot  $(j+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR SCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell and SCell during BWP switch of PSCell, respectively.

Table A.4.5.6.1.2.1-1: DL BWP switch supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NI 4 TI LIE! I	. 1. 1

Note 1: The UE is only required to be tested in one of the supported test configurations

Note 2: A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.

Note 3: NR configuration is the same for PSCell and SCells.

Table A.4.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		<b>I</b>	test
NR RF Channel Number		2, 3	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
Active SCell		Cell 3	SCell on RF channel number 3.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	U	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	ub	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on SCC.
on RF channel number 3	uD.	Ů	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
Cell3 timing offset to cell2	μS	3	Synchronous cells
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.4.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parame	ter	Unit	Cell 2 Cell 3			
Frequency Range			FF	R1		
Duplex mode	Config 1,4		FDD			
	Config 2,3,5,6		TE	)D		
TDD configuration	Config 1,4		Not Ap	olicable		
	Config 2,5		TDDConf.1.1			
	Config 3,6		TDDC	onf.1.2		
BW <sub>channel</sub>	Config 1,4		10 MHz: I	N <sub>RB,c</sub> = 52		
	Config 2,5		10 MHz: I	$N_{RB,c} = 52$		
	Config 3,6			I <sub>RB,c</sub> = 106		
Active BWP ID			1, 2	0		
Initial BWP	Config 1,4		DLBWP.0.2	DLBWP.0.2		
Configuration	Config 2,5					
	Config 3,6					
Active BWP-0	Config 1,4		NA	DLBWP.0.2		
Configuration	Config 2,5					
	Config 3,6					
Active BWP-1	Config 1,4		DLBWP.1.3	NA		
Configuration	Config 2,5					
	Config 3,6					
Active BWP-2	Config 1,4		DLBWP.1.1	NA		
Configuration	Config 2,5					
	Config 3,6					
PDSCH Reference	Config 1,4		SR.1.	1 FDD		
measurement channel	Config 2,5		SR.1.	1 TDD		
	Config 3,6		SR2.1 TDD			
RMSI CORESET	Config 1,4		CR.1.1 FDD			
parameters	Config 2,5		CR.1.1 TDD			
	Config 3,6		CR2.1			
Dedicated CORESET	Config 1,4		CCR.1			
parameters	Config 2,5		CCR.1	.1 TDD		
	Config 3,6		CCR.2	.1 TDD		

OCNG Patterns			OF	P.1	
SSB Configuration			SSB.1 FR1		
-	Config 3,6		SSB.2 FR1		
SMTC Configuration			SMTC.1		
TRS Configuration	Config 1,4		TRS.1.	.1 FDD	
	Config 2,5		TRS.1.	.1 TDD	
	Config 3,6		TRS.1.2 TDD		
Antenna Configuration			1)	(2	
Propagation Condition			AW	GN	
EPRE ratio of PSS to S	SS	dB	0	0	
EPRE ratio of PBCH DN					
EPRE ratio of PBCH to	PBCH DMRS				
EPRE ratio of PDCCH [	OMRS to SSS				
EPRE ratio of PDCCH t	o PDCCH DMRS				
EPRE ratio of PDSCH D					
EPRE ratio of PDSCH to					
EPRE ratio of OCNG DI					
EPRE ratio of OCNG to	OCNG DMRS Note 1	dBm/15			
Noc <sup>Note 2</sup>	N <sub>oc</sub> Note 2		[-104]	[-104]	
		kHz			
SS-RSRP Note 3		dBm/15	[-87]	[-87]	
<u> </u>		kHz			
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	17	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	17	
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/	TBD	TBD	
	Jan. 19 1,2, 1,0	9.36MHz			
	Config 3,6	dBm/	TBD	TBD	
N. d. CONO. I. III	•	38.16MHz			
			y allocated and a constant to	tai transmitted power	
	sity is achieved for all		not specified in the test is ass	sumed to be constant over	
			WGN of appropriate power for		
			other parameters for informa		
	parameters themselve		onioi parameters for informa	dion pulposes. They are	
			an UL BWP. DLBWP.0.2 is I	inked with ULBWP.0.2	
Di di parte di più di					

#### A.4.5.6.1.2.2 Test Requirements

TS 38.213 [3].

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelay}+k11)$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [15].

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot  $(i+T_{BWPswitchDelay}+k1)$ ,  $(j+T_{BWPswitchDelay}+k1)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: FFS value of k1 for type 1 and type 2 UE.

#### A.4.5.6.2 RRC-based Active BWP Switch

A.4.5.6.2.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

#### A.4.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in section 8.6.3. Supported test configurations are shown in Table A.4.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.4.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.4.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PSCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

#### During T1,

Time period T1 starts when a *RRCReconfiguration* with bandwidth part configuration BWP-2, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PSCell's slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$  as defined in section 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in section 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including BWP switch command is sent till the time when RRC Reconfiguration Complete message is received.

Table A.4.5.6.2.1.1-1: DL BWP switch supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only i	required to be tested in one of the supported test configurations

Table A.4.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		I	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	

Table A.4.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.1.2
BW <sub>channel</sub>	Config 1,4		10 MHz: N <sub>RB,c</sub> = 52
	Config 2,5		10 MHz: N <sub>RB,c</sub> = 52
	Config 3,6		40 MHz: N <sub>RB,c</sub> = 106
Active DL BWP ID			1, 2
Initial DL BWP	Config 1,4		DLBWP.0.2
Configuration	Config 2,5		
	Config 3,6		
Active DL BWP-1	Config 1,4		DLBWP.1.3
Configuration	Config 2,5		
	Config 3,6		
Active DL BWP-2	Config 1,4		DLBWP.1.1
Configuration	Config 2,5		
	Config 3,6		
Initial UL BWP	Config 1,4		ULBWP.0.2
Configuration	Config 2,5		

		Config 3,6					
Active UL BWP-	Active UL BWP-1 Config 1,4			ULBWP.1.3			
Configuration		Config 2,5					
		Config 3,6					
Active UL BWP-	·2	Config 1,4		ULBWP.1.1			
Configuration		Config 2,5					
		Config 3,6					
PDSCH Referer	nce	Config 1,4		SR.1.1 FDD			
measurement c	hannel	Config 2,5		SR.1.1 TDD			
		Config 3,6	1	SR2.1 TDD			
RMSI CORESE	T	Config 1,4		CR.1.1 FDD			
parameters		Config 2,5	1	CR.1.1 TDD			
•		Config 3,6		CR2.1 TDD			
Dedicated COR	ESET	Config 1,4		CCR.1.1 FDD			
parameters		Config 2,5		CCR.1.1 TDD			
F		Config 3,6	1	CCR.2.1 TDD			
OCNG Patterns		Comig 0,0		OP.1			
SSB Configurati	on	Config 1,2,4,5		SSB.1 FR1			
COD Connigurati	011	Config 3,6	1	SSB.2 FR1			
SMTC Configura	ation	Coming 0,0		SMTC.1			
TRS Configurati	on	Config 1,4		TRS.1.1 FDD			
Tito comigarat	011	Config 2,5		TRS.1.1 TDD			
		Config 3,6		TRS.1.2 TDD			
Antenna Config	ıration	Coming 0,0		1x2			
Propagation Co				AWGN			
EPRE ratio of PS			dB	0			
EPRE ratio of PB		to SSS	d d b	9			
EPRE ratio of PB0	CH to PBC	H DMRS					
EPRE ratio of PD							
EPRE ratio of PD							
EPRE ratio of PD							
EPRE ratio of PD							
EPRE ratio of OC			-				
Noc <sup>Note 2</sup>	NG to OCI	NG DMRS (Note 1)	dBm/15	[-104]			
Noc. 1818 2			kHz	[-104]			
SS-RSRP Note 3			dBm/15	[-87]			
33-K3KF			kHz	[-0/]			
Ê <sub>s</sub> /I <sub>ot</sub>			dB	17			
Ês/Noc							
Io <sup>Note3</sup>			dB dBm/	17 TBD			
10		Config 1,2,4,5	9.36MHz	160			
		Config 3,6	dBm/ 38.16MHz	TBD			
Note 1: OCN	G shall he	e used such that ho		y allocated and a constant			
				red for all OFDM symbols.			
				not specified in the test is			
				ne and shall be modelled			
	as AWGN of appropriate power for Noc to be fulfilled.						
Note 3: SS-RSRP and Io levels have been derived from other paramete							
				meters themselves.			
				an UL BWP. DLBWP.0.2			
		JLBWP.0.2; DLBWF					
DLBV	VP.1.3 is	linked with ULBWP	1.1.3 defined in	clause 12 of			
TS 38	3.213 [3].						

#### A.4.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in a slot  $(i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

The rate of correct events observed during repeated tests shall be at least 90%.

### A.4.5.7 PSCell addition and release delay

#### A.4.5.7.1 Addition and Release Delay of known NR PSCell

#### A.4.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in section 7.31.2 [15] for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.4.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.4.5.7.1.1-2 and cell-specific parameters in A.4.5.7.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A4 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event A4. After receiving the Event A4, the test system shall send a RRC message to the UE to release the measurement gaps.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T2, after the measurement gaps are released by the test system. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T3.

The test system shall observe the periodic reporting of CSI for PSCell during T4. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T4.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T4, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T5.

Table A.4.5.7.1.1-1: Supported test configurations for FR1 PSCell

Configuration	Description			
1	LTE FDD, NR SCS 15 kHz, BW 10 MHz, FDD			
2	LTE FDD, NR SCS 15 kHz, BW 10 MHz, TDD			
3	LTE FDD, NR SCS 30 kHz, BW 40 MHz, TDD			
4	LTE FDD, NR SCS 15 kHz, BW 10 MHz, FDD			
5	LTE FDD, NR SCS 15 kHz, BW 10 MHz, TDD			
6	LTE FDD, NR SCS 30 kHz, BW 40 MHz, TDD			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.4.5.7.1.1-2: General Test Parameters for PSCell Addition and Release

Parameter		Unit	Value	Comment
RF Channel N	umber		1, 2	Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell
Initial	Active PCell		Cell1	PCell on RF channel number 1.
Condition	Neighbour cell	1	Cell2	Neighbour cell on RF channel number 2.
Final	Active PCell		Cell1	PCell on RF channel number 1.
Condition	Neighbour Cell		Cell2	PSCell on RF channel number 2.
A4	Hysteresis	dB	0	Hysteresis for evaluation of event A4.
	Threshold RSRP	dBm	-93	Actual RSRP threshold for event A4. Needs to take absolute accuracy tolerance in section 9.1.11.1 into account plus margin.
	Time to Trigger	S	0	
DRX			OFF	Continuous monitoring of primary cell
Measurement	gap pattern ld		0	Gaps are configured before T2 and released before T3.
PRACH config	PRACH configuration on cell2		FR1 PRACH configuration 2	Captured in [A.3.8.2.1]
CQI/PMI period configuration in	dicity and offset ndex on cell2		TBD	CQI reporting for PSCell every uplink subframe
Cell-individual RF channel nu	offset for cells on mber 1	dB	0	Individual offset for cells on primary component carrier.
Cell-individual RF channel nu	offset for cells on mber 2	dB	0	Individual offset for cells on carrier frequency of cell2.
T1			5	During this time the PCell shall be known and cell2 shall be unknown.
T2		S	≤ 5	During this time the UE shall identify neighbour cell (cell2) and report event A4.
T3		S	1	During this time the UE adds the PSCell.
T4		S	1	During this time the UE sends CSI reports for PSCell.
T5		S	1	During this time the UE releases the PSCell.

Table A.4.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

Parameter	Unit	Config	Test					
Farailletei	Onic	Coming	T1	T2	Т3	T4	T5	
E-UTRA RF Channel Number		1,2,3,4,5,6			1			
NR RF Channel Number		1,2,3,4,5,6	2					
TDD		1,4	1,4 Not Applicable 2,5 TDDConf.1.1					
configuration		2,5						
		3,6	TDDConf.1.2					
		1,4	10: N <sub>RB,c</sub> = 52					
BW <sub>channel</sub>	MHz	2,5	10: N <sub>RB,c</sub> = 52					
	3,6		40: N <sub>RB,c</sub> = 106					
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1					
Dedicated BWP Configuration		1,2,3	DLBWP.1.1 ULBWP.1.1					
PDSCH		1,4	SR.1.1 FDD					
Reference		2,5	SR.1.1 TDD					
measurement channel		3,6		S	R.2.1 TD	D		

		ı	1	
RMSI CORESET		1,4		CR.1.1 FDD
Reference		2,5		CR.1.1 TDD
Channel		3,6		CR.2.1 TDD
Dedicated		1,4		CCR.1.1 FDD
CORESET		2,5		CCR.1.1 TDD
Reference Channel		3,6		CCR.2.1 TDD
OCNG Patterns		1,2,3,4,5,6		OP.1
SSB		1,2,4,5		SSB.1 FR1
configuration		3,6		SSB.2 FR1
SMTC		1,2,4,5		SMTC.1
configuration		3,6		SMTC.1
EPRE ratio of		,		
PSS to SSS				
EPRE ratio of				
PBCH DMRS to SSS				
EPRE ratio of	1			
PBCH to PBCH				
DMRS				
EPRE ratio of				
PDCCH DMRS				
to SSS EPRE ratio of	-			
PDCCH to				
PDCCH DMRS	dB	1,2,3,4,5,6		0
EPRE ratio of				
PDSCH DMRS				
to SSS				
EPRE ratio of				
PDSCH to				
PDSCH	-			
EPRE ratio of OCNG DMRS to				
SSS(Note 1)				
EPRE ratio of	1			
OCNG to OCNG				
DMRS (Note 1)				
$N_{oc}$ Note2	dBm/15 kHz	1,2,3,4,5,6	N/A	-85
	ID (2.2.2	1,2,4,5	N/A	-85
$N_{oc}$ Note2	dBm/SCS	3,6	N/A	-82
$\hat{E}_{s}/I_{ot}$		1,2,3,4,5,6	-infinity	0
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	-infinity	0
SS-RSRP <sup>Note3</sup>	ID /000	1,2,4,5	-infinity	-85
	dBm/SCS	3,6	-infinity	-82
Io <sup>Note3</sup>	dBm/9.36MHz	1,2,4,5	N/A	-57
	dBm/38.1MHz	3,6	N/A	-51
Propagation				
condition		1,2,3,4,5,6		AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate

power for  $N_{oc}$  to be fulfilled.

Note 3:	SS-RSRP and lo levels have been derived from other parameters for information
	purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference
	and noise at each receiver antenna port.

#### A.4.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 232 ms<sup>Note1</sup> into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest [20]ms into T5.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 [15]:

$$T_{config}$$
 PSCell =  $T_{RRC}$  delay +  $T_{processing}$  +  $T_{search}$  +  $T_{\Delta}$  +  $T_{PSCell}$  DU + 2msWhere:

 $T_{RRC\_delay} = 20ms$ 

 $T_{processing} = 20 \text{ms}$ 

 $T_{search} = 0$ 

 $T_{\Delta} = 20 ms$ 

 $T_{PSCell\ DU} = 16*10+10 = 170ms$ 

### A.4.6 Measurement procedure

### A.4.6.1 Intra-frequency Measurements

### A.4.6.1.1 EN-DC event triggered reporting tests without gap under non-DRX

#### A.4.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.1.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.1.2-1, A.4.6.1.1.2-2, A.4.6.1.1.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.4.6.1.1.2-1: Supported test configurations

	Configuration	Description				
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.4.6.1.1.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR	
			Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1	
			2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	N/A	OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	S	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.4.6.1.1.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test	Cell 2		Cell 3			
		configuration	T1	T2	T1	T2		
TDD configuration		1	N	/A	N/A			
		2	TDDC	onf.1.1	TDDC	onf.1.1		
		3	TDDC	TDDConf.2.1		TDDConf.2.1 TDDConf.2.1		onf.2.1
PDSCH RMC		1	SR.1.	1 FDD	N/A			
configuration		2	SR.1.	SR.1.1 TDD				
		3	SR.2.	1 TDD				
RMSI CORESET		1	CR.1.1 FDD		CR.1.1 FDD CR.1.1		1 FDD	
RMC		2	CR.1.1 TDD		CR.1.	1 TDD		
configuration		3	CR.2.	1 TDD	CR.2.1 TDD			

Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD
configuration		3	CCR.2	.1 TDD	CCR.2	.1 TDD
OCNG Patterns		1, 2, 3	O	P.1 OP.1		
TRS configuration		1	TRS.1	.1 FDD	N,	/A
		2	TRS.1	.1 TDD	N,	/A
		3	TRS.1	.2 TDD	N.	/A
Initial BWP		1, 2, 3	DLBV	/P.0.1	DLBW	/P.0.1
configuration			ULBV	/P.0.1	ULBW	/P.0.1
Active DL BWP		1, 2, 3	DLBV	/P.1.1	DLBW	/P.1.1
configuration						
Active UL BWP		1, 2, 3	ULBV	/P.1.1	ULBW	/P.1.1
configuration						
RLM-RS		1, 2, 3	SS	SB	SS	SB
Note 2	dBm/SCS	1	-98			
oc noo z		2	-98			
		3		-95		
$N_{oc}$ Note 2	dBm/15 KHz	1	-98			
oc		2				
		3				
$\hat{E}_{s}/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
S/ Tot		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
$L_s/V_{oc}$		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16
Propagation		1, 2, 3	AWGN			
Condition	Condition					
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period						

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for

 $N_{oc}$  to be fulfilled.

SS-RSRP levels have been derived from other parameters for information purposes. They are Note 3: not settable parameters themselves.

#### A.4.6.1.1.3 **Test Requirements**

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.1.2 EN-DC event triggered reporting tests without gap under DRX

#### A.4.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.2.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.2.1-1, A.4.6.1.2.1-2, A.4.6.1.2.1-3 and A.4.6.1.2.1-4 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.4.6.1.2.2-1: Supported test configurations

C	onfiguration	Description			
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note:	Note: The UE is only required to be tested in one of the supported test configurations.				

Table A.4.6.1.2.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Unit	Test configur	Value		Comment
		ation	Test 1	Test 2	
Active cell		1, 2, 3	E-UTRAN Ce Cell 2	II 1 and NR	
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and	Cell 3	
SSB configuration		1 2 3	SSB.1 FR1 SSB.1 FR1 SSB.2 FR1		
SMTC configuration		1 2 3	SMTC.2 SMTC.1 SMTC.1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells

T1	S	1, 2, 3	5		
T2	S	1, 2, 3	5	10	

Table A.4.6.1.2.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Unit	Test	Cell 2		Cell 3	
		configuration	T1	T2	T1	T2
TDD configuration		1	N	/A	N.	/A
		2	TDDC	onf.1.1	TDDC	onf.1.1
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC		1	SR.1.1 FDD N/A			/A
configuration		2	SR.1.	1 TDD		
		3	SR.2.	1 TDD		
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD
configuration		3		1 TDD	CR.2.	1 TDD
Dedicated		1		.1 FDD		.1 FDD
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD
configuration		3		.1 TDD		.1 TDD
OCNG Patterns		1, 2, 3		P.1	OF	
TRS configuration		1		.1 FDD		/A
J		2		.1 TDD	N,	/A
		3	TRS.1.2 TDD		N/A	
Initial BWP		1, 2, 3	DLBWP.0.1 DLBWP.0.1			
configuration		, _, -	ULBWP.0.1 ULBWP.0.1			
Active DL BWP		1, 2, 3	DLBWP.1.1 DLBWP.1.1			
configuration						
Active UL BWP		1, 2, 3	ULBV	/P.1.1	ULBW	/P.1.1
configuration						
RLM-RS		1, 2, 3	S	SB	SS	SB
Note 2	dBm/SCS	1			·98	
1 oc		2			·98	
		3			·95	
$N_{oc}$ Note 2	dBm/15 KHz	1		-	98	
oc .		2				
		3				
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-1.46	-Infinity	-1.46
S/ Tot		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
= s / 1 · oc		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16

Propagati	agation		1, 2, 3	AWGN	
Condition	1				
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period				to the UE prior to the start of time period	
	T2.				
Note 2:	Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for				
	$N_{oc}$ to be fulfilled.				
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

#### A.4.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.1.3 EN-DC event triggered reporting tests with per-UE gaps under non-DRX

#### A.4.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.4.6.1.3.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.3.1-1 and A.4.6.1.3.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.4.6.1.3.2-1: Supported test configurations

Co	onfiguration	Description		
	1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
	2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
	3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note:	Note: The UE is only required to be tested in one of the supported test configurations.			

Table A.4.6.1.3.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2, 3	40	
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
		2	CSI-RS.1.2 TDD	
		3	CSI-RS.2.2 TDD	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	N/A	OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	S	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.4.6.1.3.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test	Cell 2		Cell 3	
		configuration	T1	T2	T1	T2
TDD configuration		1	N/	/A	N/	/A
		2	TDDC	TDDConf.1.1 TDDConf.2.1		onf.1.1
		3	TDDC			onf.2.1
PDSCH RMC		1	SR.1.1 FDD		N/A	
configuration		2	SR.1.1 TDD			
		3	SR.2.	SR.2.1 TDD		
RMSI CORESET		1	CR.1.1 FDD CF		CR.1.	1 FDD
RMC		2	CR.1.1 TDD CR		CR.1.	1 TDD
configuration		3	CR.2.	1 TDD	CR.2.	1 TDD

Dedicated		1	CCR.1.1 FDD CCR.1.1 FDD			.1 FDD
CORESET RMC		2	CCR.1.1 TDD CCR.1.1 TI		.1 TDD	
configuration		3	CCR.2.1 TDD C		CCR.2	.1 TDD
OCNG Patterns		1, 2, 3	OF	P.1	OF	P.1
TRS configuration		1	TRS.1	.1 FDD	N/	/Α
		2	TRS.1	.1 TDD	N/	/Α
		3	TRS.1	.2 TDD	N/	/Α
Initial BWP		1, 2, 3	DLBV	/P.0.1	DLBW	/P.0.1
configuration			ULBW	/P.0.1	ULBW	/P.0.1
Active DL BWP		1, 2, 3	DLBV	/P.1.2	DLBW	/P.1.1
configuration						
Active UL BWP		1, 2, 3	ULBV	/P.1.2	ULBW	/P.1.1
configuration						
RLM-RS		1, 2, 3	CSI	CSI-RS SSB		SB
$N_{oc}$ Note 2	dBm/SCS	1	-98			
oc oc		2	-98			
		3	-95			
$N_{oc}$ Note 2	dBm/15 KHz	1	-98			
- voc		2				
		3				
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-1.46	-Infinity	-1.46
L <sub>s</sub> /L <sub>ot</sub>		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
$\sum_{s}/1 \cdot oc$		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16
Propagation		1, 2, 3	AWGN			
Condition						

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.4.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.1.4 EN-DC event triggered reporting tests with per-UE gaps under DRX

#### A.4.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.4.6.1.4.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.4.2-1, A.4.6.1.4.2-2, A.4.6.1.4.2-3 A.4.6.1.4.2-4 and A.4.6.1.4.2-5 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Co	onfiguration	Description				
	1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
	3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.4.6.1.4.2-1: Supported test configurations

Table A.4.6.1.4.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test	Value		Comment
		configur ation	Test 1	Test 2	
Active cell		1, 2, 3	E-UTRAN Ce	II 1 and NR	
			Cell 2		
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1		
			2: Cell 2 and 0	Cell 3	
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
CSI-RS parameters		1	CSI-RS.1.2 FDD		
		2	CSI-RS.1.2 T	DD	
		3	CSI-RS.2.2 T	DD	

A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	S	1, 2, 3	5		
T2	S	1, 2, 3	5	10	

Table A.4.6.1.4.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test	Ce	Cell 2		Cell 3		
		configuration	T1	T2	T1	T2		
TDD configuration		1	N	I/A	N	/A		
		2	TDDC	onf.1.1	TDDC	onf.1.1		
		3	TDDC	Conf.2.1	TDDC	onf.2.1		
PDSCH RMC		1	SR.1	.1 FDD	N	/A		
configuration		2	SR.1	.1 TDD	1			
		3	SR.2	.1 TDD				
RMSI CORESET		1	CR.1	.1 FDD	CR.1.	1 FDD		
RMC		2	CR.1	.1 TDD	CR.1.	1 TDD		
configuration		3	CR.2	.1 TDD	CR.2.	1 TDD		
Dedicated		1	CCR.	I.1 FDD	CCR.1	.1 FDD		
CORESET RMC		2		I.1 TDD		.1 TDD		
configuration		3		2.1 TDD		.1 TDD		
OCNG Patterns		1, 2, 3		P.1		P.1		
TRS configuration		1		TRS.1.1 FDD		N/A		
		2	TRS.1.1 TDD		N/A			
		3	TRS.1.2 TDD		N/A			
Initial BWP		1, 2, 3	DLBWP.0.1		DLBV	/P.0.1		
configuration		, ,	ULBWP.0.1 ULBWP.0.1		/P.0.1			
Active DL BWP		1, 2, 3	DLBWP.1.2 DLBWP.		/P.1.1			
configuration								
Active UL BWP		1, 2, 3	ULBWP.1.2 ULBWP.1.1		/P.1.1			
configuration								
RLM-RS		1, 2, 3	CSI-RS SSB		SB			
$N_{oc}$ Note 2	dBm/SCS	1	-98					
1 oc		2	-98					
		3	-95					
$N_{oc}$ Note 2	dBm/15 KHz	1	-98					
oc .		2	_					
		3						
$\hat{E}_{s}/I_{ot}$	dB	1	4 -1.46 -Infi		-Infinity	-1.46		
s/ ot		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4		
-s/ 1 oc		2						

		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16
Propagation		1, 2, 3	AWGN			
Condition						

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.4.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.1.5 EN-DC event triggered reporting tests without gap under non-DRX with SSB index reading

#### A.4.6.1.5.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.5.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for FDD PSCell are given in Table A.4.6.1.5.1-1 and A.4.6.1.5.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.4.6.1.5.2-1: Supported test configurations

Configuration Description					
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
Note:	Note: The UE is only required to be tested in one of the supported test configurations.				

Table A.4.6.1.5.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1	NR Cell 3	Cell to be identified.
RF Channel Number		1	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	N/A	OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.4.6.1.5.1-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test	Се	Cell 2		II 3	
		configuration	T1	T2	T1	T2	
TDD configuration		1	N	/A	N	/A	
PDSCH RMC		1	SR.1.	1 FDD	N	/A	
configuration							
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC							
configuration							
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC							
configuration							
OCNG Patterns		1	O	P.1	OF	P.1	
TRS configuration		1	TRS.1	TRS.1.1 FDD		N/A	
Initial BWP		1	DLBWP.0.1		DLBWP.0.1		
configuration			ULBV	ULBWP.0.1		ULBWP.0.1	
Active DL BWP		1	DLBWP.1.1		DLBV	DLBWP.1.1	
configuration							
Active UL BWP		1	ULBWP.1.1 ULBWP.1.1		/P.1.1		
configuration							
RLM-RS		1	SSB SSB		SB		
$N_{oc}$ Note 2	dBm/SCS	1		-98			
$N_{_{OC}}$ Note 2	dBm/15 KHz	1	-98				
$\hat{E}_{s}/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46	
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94	
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25	
Propagation		1	AWGN				
Condition							

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.4.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.4.6.1.6 EN-DC event triggered reporting tests with SSB index reading with per-UE gaps

#### A.4.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.4.6.1.6.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.6.2-1 A.4.6.1.6.2-2 and A.4.6.1.6.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.4.6.1.6.2-1: Supported test configurations

Configuration Description		Description		
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
Note:	: The UE is only required to be tested in one of the supported test configurations.			

Table A.4.6.1.6.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1	NR Cell 3	Cell to be identified.
RF Channel Number		1	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1	Per-UE gaps	
Measurement gap repitition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	N/A	OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.4.6.1.6.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test	Cell 2		Ce	II 3	
		configuration	T1 T2		T1	T2	
TDD configuration		1	N/A		N.	/A	
PDSCH RMC		1	SR.1.1 FDD		N/A		
configuration							
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC							
configuration							
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC							
configuration							
OCNG Patterns		1	O	P.1	OF	P.1	
TRS configuration		1	TRS.1	.1 FDD	N/A		
Initial BWP		1	DLBV	√P.0.1	DLBWP.0.1		
configuration			ULBV	√P.0.1	ULBWP.0.1		
Active DL BWP		1	DLBV	VP.1.2	DLBWP.1.1		
configuration							
Active UL BWP		1	ULBV	VP.1.1	ULBWP.1.1		
configuration							
RLM-RS		1	CSI	-RS	SS	SSB	
$N_{oc}$ Note 2	dBm/SCS	1		-	-98		
$N_{oc}$ Note 2	dBm/15 KHz	1		-	-98		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-1.46	-Infinity	-1.46	
$\hat{E}_s/N_{oc}$	dB	1	4 4		-Infinity	4	
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94 -94		-94	
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25	
Propagation Condition		1	AWGN				

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.4.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.2 Inter-frequency Measurements

## A.4.6.2.1 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used

#### A.4.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.1.1-1, A.4.6.2.1.1-2, and A.4.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.1.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.1.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.1.1-1.

Table A.4.6.2.1.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

Cor	nfig	Description
1	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: Th	ne UE is only re	equired to be tested in one of the supported test configurations
Note 2: tai	rget NR cell3 h	as the same SCS, BW and duplex mode as NR serving cell2

Table A.4.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Va	lue	Comment
		configurati on	Test 1	Test 2	_
E-UTRA RF Channel		Config	,	1	One E-UTRAN TDD carrier
Number		1,2,3,4,5,6			frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1,	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (Po cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	19	
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	S	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs		Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5		
T2	S	Config 1,2,3,4,5,6	1	1	

Table A.4.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2			Cell 3
		configuratio	T1 T2		T1	T2
		n				
NR RF Channel Number		Config	1		1	
		1,2,3,4,5,6				

Duplex mode		Config 1,4		F	DD			
Duplex Houe		Config 1,4			DD			
		2,3,5,6						
BWchannel	MHz	Config 1,4		10: N	RB,c = 52			
2 T Ghamer		Config 2,5			: N <sub>RB,c</sub> = 52			
		Config 3,6		40: NR	B,c = 106			
BWP BW	MHz	Config 1,4		10: N	RB c = 52			
2 2		Config 2,5	10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52					
		Config 3,6			$_{B,c} = 106$			
TDD configuration		Config 2,5	TDDC	onf.1.1		Conf.1.1		
122 coga.ao		Config 3,6		onf.2.1		Conf.2.1		
Initial DL BWP		Config		VP.0.1	1	NA		
		1,2,3,4,5,6						
Initial UL BWP		Config	ULBV	VP.0.1		NA		
		1,2,3,4,5,6						
Dedicated DL BWP		Config	DLBV	VP.1.1		NA		
		1,2,3,4,5,6						
Dedicated UL BWP		Config	ULBV	VP.1.1		NA		
		1,2,3,4,5,6			1			
OCNG Patterns defined in		Config						
A.3.2.1.1 (OP.1)		1,2,3,4,5,6	O	P.1	(	OP.1		
PDSCH Reference		Config 1,4	SR.1.	1 FDD		-		
measurement channel		Config 2,5	SR.1.	1 TDD	1			
		Config 3,6		1 TDD	†			
CORESET Reference		Config 1,4		1 FDD	+	_		
Channel		Config 2,5		1 TDD	†			
		Config 3,6		1 TDD	†			
SMTC configuration defined in A.3.2.11.1 and A.3.2.11.2		Config 1,4	<u> </u>	SMTC.2				
		Config 2,3,5,6	SMTC.1					
PDSCH/PDCCH subcarrier	kHz	Config			4.5			
spacing		1,2,4,5			15			
		Config 3,6			30			
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH DMRS								
to SSS								
EPRE ratio of PBCH to PBCH								
DMRS								
EPRE ratio of PDCCH DMRS	İ							
to SSS								
EPRE ratio of PDCCH to		Config						
PDCCH DMRS		1,2,3,4,5,6		0		0		
EPRE ratio of PDSCH DMRS		1,2,0,7,0,0						
to SSS								
EPRE ratio of PDSCH to								
PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to					1			
OCNG DMRS (Note 1)					<u> </u>			
Note2	dBm/15 kHz				-98			
N <sub>oc</sub> Note2	dBm/S	Config			-98			
IV <sub>oc</sub>	CS	1,2,4,5						
		Config 3,6		-	-95			
SS-RSRP Note 3	dBm/S	Config	-94	-94	-Infinity	-91		
	CS	1,2,4,5	J .			]		
		Config 3,6	-91	-91	-Infinity	-88		
	•							

$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	Config	4 4 -Infinity		7	
		1,2,3,4,5,6				
$\hat{E}_s/N_{oc}$	dB	Config	4	4	-Infinity	7
		1,2,3,4,5,6				
Io <sup>Note3</sup>	dBm/9.	Config	-67.11	-67.11	-Infinity	-65.38
	36MHz	1,2,4,5				
	dBm/38	Config 3,6	-62.27	-62.27	-Infinity	-61.06
	.16MHz					
Propagation Condition		Config		AV	/GN	
		1.2.3.4.5.6				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.4.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [920] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [760] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.2.2 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used

#### A.4.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.2.1-1, A.4.6.2.2.1-2, and A.4.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.2.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.2.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.2.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.2.2.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description			
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
	3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
	6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations			
Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2					

Table A.4.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Value			Comment			
		configurati	Test	Test	Test	Test			
		on	1	1 2 3 4		4			
E-UTRA RF Channel		Config			1		One E-UTRAN TDD carrier		
Number		1,2,3,4,5,6					frequencies is used.		
NR RF Channel		Config		1,	, 2		Two FR1 NR carrier frequencies is		
Number		1,2,3,4,5,6					used.		
Active cell		Config			Cell) and	J NR	LTE Cell 1 is on E-UTRA RF		
		1,2,3,4,5,6	cell 2 (	(PScell)			channel number 1.		
							NR Cell 2 is on NR RF channel number 1.		
Neighbour cell		Config	NR ce	II 3			NR cell 3 is on NR RF channel		
		1,2,3,4,5,6					number 2.		
Gap Pattern Id		Config	0		4		As specified in clause 9.1.2-1.		
		1,2,3,4,5,6							
Measurement gap		Config	39		19				
offset		1,2,3,4,5,6							
SMTC-SSB parameters		Config 1,4	SSB.1	FR1			As specified in clause A.3.10.1		
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1		
		Config 3,6	SSB.2	FR1	R1 As :		As specified in clause A.3.10.1		
A3-Offset	dB	Config	-6						
		1,2,3,4,5,6							
Hysteresis	dB	Config	0						
-		1,2,3,4,5,6							
CP length		Config	Norma	al					
-		1,2,3,4,5,6							
TimeToTrigger	S	Config	0						
		1,2,3,4,5,6							
Filter coefficient		Config	0 L			L3 filtering is not used			
		1,2,3,4,5,6	<u> </u>						
DRX	ms	Config					As specified in clause A.3.3		
		1,2,3,4,5,6	.1	.2	.1	.2			

Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5				
T2	S	Config 1,2,3,4,5,6	1.1	11	1.1	11	

Table A.4.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Ce	Cell 2		Cell 3	
		configuratio n	T1	T2	T1	T2	
NR RF Channel Number		Config		1		2	
		1,2,3,4,5,6					
Duplex mode		Config 1,4			FDD		
		Config			TDD		
		2,3,5,6					
BWchannel	MHz	Config 1,4		10: 1	V <sub>RB,c</sub> = 52		
		Config 2,5			$N_{RB,c} = 52$		
		Config 3,6			I <sub>RB,c</sub> = 106		
BWP BW	MHz	Config 1,4			V <sub>RB,c</sub> = 52		
		Config 2,5			$N_{RB,c} = 52$		
		Config 3,6			I <sub>RB,c</sub> = 106		
TDD configuration		Config 2,5	TDDC	onf.1.1	TDE	Conf.1.1	
		Config 3,6	TDDC	onf.2.1	TDE	Conf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBV	VP.0.1		NA	
Initial UL BWP		Config	ULBV	BWP.0.1 NA		NA	
		1,2,3,4,5,6					
Dedicated DL BWP		Config	DLBV	VP.1.1		NA	
		1,2,3,4,5,6					
Dedicated UL BWP		Config	ULBV	VP.1.1		NA	
		1,2,3,4,5,6					
OCNG Patterns defined in		Config					
A.3.2.1.1 (OP.1)		1,2,3,4,5,6	O	P.1		OP.1	
PDSCH Reference		Config 1,4	SR.1.	1 FDD		-	
measurement channel		Config 2,5	SR 1	1 TDD			
		Config 3,6		1 TDD			
CORESET Reference		Config 1,4		1 FDD		_	
Channel		Config 2,5		1 TDD			
- · · · · · · · · · · · · · · · · · · ·		Config 3,6		1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2		MTC.2		
		Config 2,3,5,6	SMTC.1				
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15				
		Config 3,6			30		

EPRE ratio of PSS to SSS							
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2,3,4,5,6	(	)		0	
EPRE ratio of PDSCH DMRS to SSS		-,-,-,-,-					
EPRE ratio of PDSCH to PDSCH			-98				
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
$N_{oc}$ Note2	dBm/15 kHz						
N <sub>oc</sub> Note2	dBm/S CS	Config 1,2,4,5	-98				
		Config 3,6			-95		
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	-94	-94	-Infinity	-91	
		Config 3,6	-91	-91	-Infinity	-88	
$\hat{\mathbf{E}}_{_{\mathrm{s}}}/\mathbf{I}_{_{\mathrm{ot}}}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7	
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4 4 -Infinity 7 -67.11 -67.11 -Infinity -65.3				
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5					
	dBm/38 .16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06	
Propagation Condition		Config 1,2,3,4,5,6		A	WGN		
1							

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.4.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1080] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [10240] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1080] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [10240] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.4.6.2.3 Void

A.4.6.2.4 Void

A.4.6.2.5 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used

#### A.4.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.5.1-1, A.4.6.2.5.1-2, and A.4.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.5.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.5.1-1.

Table A.4.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description					
1		LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2		LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3		LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6		LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note 1:	The UE is only re	The UE is only required to be tested in one of the supported test configurations					
Note 2:	Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2						

Table A.4.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value		Comment	
		configurati on	Test 1	Test 2		
E-UTRA RF Channel		Config	1		One E-UTRAN TDD carrier	
Number		1,2,3,4,5,6			frequencies is used.	
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies is used.	
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.	
Gap Pattern Id		Config 1,2,3,4,5,6	0 4		As specified in clause 9.1.2-1.	
Measurement gap offset		Config 1,2,3,4,5,6	39 19			
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1	
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1	
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1	
A3-Offset	dB	Config 1,2,3,4,5,6	-6			
Hysteresis	dB	Config 1,2,3,4,5,6	0			
CP length		Config 1,2,3,4,5,6	Normal			
TimeToTrigger	S	Config 1,2,3,4,5,6	0			
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used	
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used	
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC	
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.	
		Config 2,3,5,6	3μs		Synchronous cells.	
T1	S	Config 1,2,3,4,5,6	5			
T2	S	Config 1,2,3,4,5,6	1.1	1		

Table A.4.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3	
		configuratio	T1	T2	T1	T2
		n				
NR RF Channel Number		Config	1		2	
		1,2,3,4,5,6				

Duplex mode		Config 1,4		FDD
=		Config		TDD
		2,3,5,6		
BWchannel	MHz	Config 1,4		I <sub>RB,c</sub> = 52
		Config 2,5	10: N	$I_{RB,c} = 52$
		Config 3,6		RB,c = 106
BWP BW	MHz	Config 1,4		I <sub>RB,c</sub> = 52
		Config 2,5		$I_{RB,c} = 52$
TDD configuration		Config 3,6	40: N TDDConf.1.1	RB,c = 106 TDDConf.1.1
TDD configuration		Config 2,5		
		Config 3,6	TDDConf.2.1	TDDConf.2.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1	NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1	NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1	NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1	OP.1
PDSCH Reference		Config 1,4	SR.1.1 FDD	-
measurement channel		Config 2,5	SR.1.1 TDD	1
		Config 3,6	SR2.1 TDD	1
CORESET Reference		Config 1,4	CR.1.1 FDD	-
Channel		Config 2,5	CR.1.1 TDD	]
		Config 3,6	CR2.1 TDD	
SMTC configuration defined in A.3.2.11.1 and A.3.2.11.2		Config 1,4	SI	MTC.2
		Config 2,3,5,6	SI	MTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5		15
		Config 3,6		30
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2,3,4,5,6	0	0
EPRE ratio of PDSCH DMRS to SSS		1,2,0,1,0,0		
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to				
Note2	dBm/15 kHz			-98
$N_{oc}$ Note2	dBm/S CS	Config 1,2,4,5		-98
		Config 3,6		-95

SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{\mathbf{E}}_{_{\mathrm{s}}}/\mathbf{I}_{_{\mathrm{ot}}}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5	-67.11	-67.11	-Infinity	-65.38
	dBm/38 .16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06
Propagation Condition		Config 1.2.3.4.5.6	AWGN			

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.4.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1040] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [880] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.4.6.2.6 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used

### A.4.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.6.1-1, A.4.6.2.6.1-2, and A.4.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.6.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.6.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

Config	Config Description			
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note 1: The UE is only required to be tested in one of the supported test configurations				
Note 2: target NR cell3 h	nas the same SCS, BW and duplex mode as NR serving cell2			

Table A.4.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value				Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
E-UTRA RF Channel		Config		•	1		One E-UTRAN TDD carrier
Number		1,2,3,4,5,6					frequencies is used.
NR RF Channel		Config		1,	2		Two FR1 NR carrier frequencies is
Number		1,2,3,4,5,6					used.
Active cell		Config 1,2,3,4,5,6	cell 2 (	cell 2 (PScell)		I NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4			As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		19		
SMTC-SSB parameters		Config 1,4	SSB.1	FR1			As specified in clause A.3.10.1
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3,6	SSB.2	SSB.2 FR1			As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	S	Config 1,2,3,4,5,6	0				

Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX	ms	Config 1,2,3,4,5,6	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µѕ				Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5				
T2	S	Config 1,2,3,4,5,6	1.3	13.5	1.3	13.5	

Table A.4.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2		(	Cell 3	
		configuratio n	T1	T2	T1	T2	
NR RF Channel Number		Config		1		2	
		1,2,3,4,5,6					
Duplex mode		Config 1,4		F	FDD		
		Config 2,3,5,6		-	ΓDD		
BW <sub>channel</sub>	MHz	Config 1,4		10: N	I <sub>RB,c</sub> = 52		
		Config 2,5		10: N	RB,c = 52		
		Config 3,6			RB,c = 106		
BWP BW	MHz	Config 1,4		10: N	I <sub>RB,c</sub> = 52		
		Config 2,5		10: N	I <sub>RB,c</sub> = 52		
		Config 3,6		40: N	RB,c = 106		
OCNG Patterns defined in		Config					
A.3.2.1.1 (OP.1)		1,2,3,4,5,6	OF	P.1		OP.1	
PDSCH Reference		Config 1,4		1 FDD	-		
measurement channel		Config 2,5	SR.1.	1 TDD			
		Config 3,6		1 TDD			
CORESET Reference		Config 1,4		1.1 FDD -			
Channel		Config 2,5		1 TDD			
		Config 3,6	CR2.	1 TDD			
TDD configuration		Config 2,5		TDD	Conf.1.1		
		Config 3,6		TDD	Conf.2.1		
Initial DL BWP		Config 1,2,3,4,5,6		DLBWP.0.1			
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1				
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1				
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1				
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2				

		Config 2,3,5,6 SMTC.1					
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15				
		Config 3,6			30		
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2,3,4,5,6	0			0	
EPRE ratio of PDSCH DMRS to SSS		1,=,0,1,0,0					
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
$N_{oc}^{}$ Note2	dBm/15 kHz		-98				
$N_{oc}^{}$ Note2	dBm/S CS	Config 1,2,4,5	-98				
		Config 3,6			-95		
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	-94	-94	-Infinity	-91	
		Config 3,6	-91	-91	-Infinity	-88	
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7	
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7	
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5	-67.11	-67.11	-Infinity	-65.38	
	dBm/38 .16MHz	Config 3,6	-62.27	-62.27	-Infinity	-61.06	
Propagation Condition Config AWGN 1,2,3,4,5,6							
Note 1: OCNG shall be used spectral density is ac				and a consta	int total trans	mitted power	
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant							

over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\it oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

SS-RSRP minimum requirements are specified assuming independent interference and noise at Note 4: each receiver antenna port.

#### A.4.6.2.6.2 **Test Requirements**

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1280] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [13440] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1280] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [13440] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.4.6.2.7 Void

A.4.6.2.8 Void

### A.4.6.3 L1-RSRP measurement for beam reporting

### A.4.6.3.1 SSB based L1-RSRP measurement when DRX is not used

### A.4.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.3.1.1-1.

Table A.4.6.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

	Config	Description				
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
	6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations					

### A.4.6.3.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.3.1.2-1 and Table A.4.6.3.1.2-2 below.

In CSI measurement configuratation, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.3.1.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
·	3,6		TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
3	3,6		TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1,4		SR.1.1 FDD
channel	2,5		SR.1.1 TDD
Chariner	3,6		SR.2.1 TDD
RMSI CORESET Reference	1,4		CR.1.1 FDD
Channel	2,5		CR.1.1 TDD
Chamer	3,6		CR.2.1 TDD
D !	1,4		CCR.1.1 FDD
Dedicated CORESET Reference	2,5		CCR.1.1 TDD
Channel	3,6		CCR.2.1 TDD
	1,4		SSB.3 FR1
SSB configuration	2,5		SSB.3 FR1
<b>3</b>	3,6		SSB.4 FR1
OCNG Patterns	1~6		OP.1
			DLBWP.0.1
Initial BWP Configuration	1~6		ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		Off
reportConfigType	1~6		periodic
reportQuantity	1~6		ssb-Index-RSRP
Number of reported RS	1~6		2
L1-RSRP reporting period	1~6	slot	80
T1	1~6		5
T2		S	1
	1~6	S	l
EPRE ratio of PSS to SSS	1		
EPRE ratio of PBCH DMRS to SSS	-		
EPRE ratio of PBCH to PBCH			
DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS	1~6	dB	0
EPRE ratio of PDSCH to PDSCH DMRS	-		
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>	1		
EPRE ratio of OCNG to OCNG DMRS Note 1	-		
Propagation condition	1~6		AWGN
r ropagation condition	1~0		AVVGIN

SSB#0 SSB#1 **Parameter** Config Unit T1 **T2** T1 **T2**  $N_{oc}$  Note2 1~6 dBm/15kHz -94.65 1,2,4,5 -94.65  $N_{oc}$  Note2 dBm/SSB SCS 3.6 -91.65  $\hat{E}_{s}/I_{ot}$ 1~6 dB 0 0 -Infinity 3 1,2,4,5 -94.65 -94.65 -Infinity -91.65 SSB RSRP Note3 dBm/SSB SCS 3,6 -91.65 -91.65 -Infinity -88.65 1,2,4,5 dBm/9.36 MHz -63.69 -63.69 -66.70 -61.93 lo Note3 dBm/38.16 MHz -57.59 -57.59 3.6 -60.61 -55.84  $\hat{E}_{s}/N_{oc}$ 1~6 dB 0 0 -Infinity

Table A.4.6.3.1.2-2: SSB specific test parameters

### A.4.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. After 480 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in 10.1.19.1.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.3.2 SSB based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.4.6.3.1.

## A.4.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

### A.4.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.3.3.1-1.

Table A.4.6.3.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

Config	Description					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations					

### A.4.6.3.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.3.3.2-1 and Table A.4.6.3.3.2-2 below.

In CSI measurement configuratation, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of two successive time periods, with time duration of T1, and T2 respectively. At 20ms from the beginning of T2, UE is triggered to measure on the aperiodic CSI-RS resource set containing two resources, and to report based on the reporting configuration in Table A.4.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
·	3,6	1	TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6	1	TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1,4		SR.1.1 FDD
channel	2,5		SR.1.1 TDD
Charline	3,6		SR.2.1 TDD
	1,4		CR.1.1 FDD
RMSI CORESET Reference Channel	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference	1,4		CCR.1.1 FDD
Channel	2,5		CCR.1.1 TDD
Chamer	3,6		CCR.2.1 TDD
	1,4		SSB.3 FR1
SSB configuration	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
	1,4		CSI-RS 1.2 FDD
CSI-RS configuration	2,5		CSI-RS 1.2 TDD
	3,6		CSI-RS 2.2 TDD
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		Off
reportConfigType	1~6		aperiodic
reportQuantity	1~6		cri-RSRP
Number of reported RS	1~6		2
			SSB#0 for resource#0
qcl-Info	1~6		SSB#1 for resource#1

reportSlotOffsetList	1~6		TBD
T1	1~6	S	5
T2	1~6	S	1
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS			
EPRE ratio of PDSCH DMRS to SSS	1~6	dB	0
EPRE ratio of PDSCH to PDSCH			
DMRS			
EPRE ratio of OCNG DMRS to			
SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS			
Note 1			
Propagation condition	1~6		AWGN

Table A.4.6.3.3.2-2: CSI-RS specific test parameters

Parameter	Config	Unit	CSI-	RS#0	CSI-I	RS#1			
Parameter	Config	Coming		T2	T1	T2			
$N_{oc}^{ m Note2}$	1~6	dBm/15kHz	-94.65						
<b>M</b> Note2	1,2,4,5	dBm/SSB SCS		-94.65					
$N_{oc}^{}$ Note2	3,6	UBIII/33B 3C3	-91.65						
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$	1~6	dB	-Infinity	0	-Infinity	3			
CSI-RS RSRP	1,2,4,5	dBm/SSB SCS	-Infinity	-94.65	-Infinity	-91.65			
Note3	3,6	dbiii/00b 000	-Infinity	-91.65	-Infinity	-88.65			
lo Note3	1,2,4,5	dBm/9.36 MHz	-66.70	-63.69	-66.70	-61.93			
IO Notes	3,6	dBm/38.16 MHz	-60.61	-57.59	-60.61	-55.84			
$\hat{E}_s/N_{oc}$	1~6	dB	-Infinity	0	-Infinity	3			

### A.4.6.3.3.3 Test Requirements

The UE shall send L1-RSRP report at slot [TBD] from the beginning of T2. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in 10.1.20.1.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.4.6.3.3.

# A.4.7 Measurement Performance requirements

### A.4.7.1 SS-RSRP

# A.4.7.1.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 10.1.2.1.1 and 10.1.2.1.2 for intra frequency measurements.

### A.4.7.1.1.2 Test parameters

In this set of test cases all NR cells are on the same carrier frequency. Supported test configurations are shown in table A.4.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra frequency measurements are tested by using the parameters in A.4.7.1.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in section A.3.7.2.1 In all test cases, Cell 2 is the PSCell, and Cell 3 the target cell.

Table A.4.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only requir	ed to be tested in one of the supported test configurations

Table A.4.7.1.1.2-2: SS-RSRP Intra frequency test parameters

Done		Heit	Te	est 1	Te	st 2	Test 3			
Para	meter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3		
Physical cell ID			489	0	489	0	489	0		
SSB ARFCN			fr	eq1	fre	eq1	freq1			
Duplex mode	Config 1,4				FD	D				
Duplex mode	Config 2,3,5,6		TDD							
	Config 1,4				Not App	olicable				
TDD configuration	Config 2,5				TDDCc					
	Config 3,6				TDDCc					
	Config 1,4				10: N <sub>RB</sub>					
BW <sub>channel</sub>	Config 2,5	MHz	10: N <sub>RB,c</sub> = 52							
	Config 3,6		40: N <sub>RB,c</sub> = 106							
Downlink initial BWP configuration				DLBWP.0.1						
Downlink dedicated BWP configuration			DLBWP.1.1							
Uplink initial BWP configu			ULBWP.0.1							
Uplink dedicated BWP co	onfiguration					ULBWP.1.1				
	Config 1,4		TRS.1. 1 FDD	NA	TRS.1.1 FDD	NA	TRS.1. 1 FDD	NA		
TRS configuration	Config 2,5		TRS.1. 1 TDD	NA	TRS.1.1 TDD	NA	TRS.1. 1 TDD	NA		
	Config 3,6		TRS.1. 2 TDD	NA	TRS.1.2 TDD	NA	TRS.1. 2 TDD	NA		
DRX Cycle		ms			Not App	licable				
	Config 1 4		SR.1.1		SR.1.1		SR.1.1			
	Config 1,4		FDD		FDD		FDD			
PDSCH Reference measurement channel	Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-		
	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD			

		Config 1,4		CR.1.1		CR.1.1		CR.1.1	
		Corning 1,4		FDD		FDD		FDD	
RMSI CORI	-	Config 2,5		CR.1.1	-	CR.1.1	_	CR.1.1	_
Reference (	Jhannel	3 7-	_	TDD		TDD		TDD	
		Config 3,6		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
				CCR.1.		CCR.1.		CCR.1.	
		Config 1,4		1 FDD		1 FDD		1 FDD	
				CCR.1.		CCR.1.		CCR.1.	1
Control Cha	nnel RMC	Config 2,5		1 TDD	-	1 TDD	-	1 TDD	-
				CCR2.1		CCR2.		CCR2.1	
		Config 3,6		TDD		1 TDD		TDD	
		Config 1,4		SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	SSB.1
		Corning 1,4		FR1	FR1	FR1	FR1	FR1	FR1
SSB configu	ıration	Config 2,5		SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	SSB.1
COD comig		Coming 2,0		FR1	FR1	FR1	FR1	FR1	FR1
		Config 3,6		SSB.2	SSB.2	SSB.2	SSB.2	SSB.2	SSB.2
				FR1	FR1	FR1	FR1	FR1	FR1
Time offset	with Cell 2	Config 1,4	ms	-	3	-	3	-	3
		Config 2,3,5,6 Config 1,4	μs	-	3	SMT		-	3
SMTC confi	guration	Config 1,4  Config 2,3,5,6				SMT			
OCNG Patte	OCNG Patterns					OP			
PDSCH/PD		Config 1,2,4,5				15 k			
	subcarrier spacing Config 3,6		kHz			30k			
	EPRE ratio of PSS to SSS								
	of PBCH DMR								
	of PBCH to PE								
	of PDCCH DM								
EPRE ratio	EPRE ratio of PDCCH to PDCCH DMRS		dB	0	0	0	0	0	0
	EPRE ratio of PDSCH DMRS to SSS								
	EPRE ratio of PDSCH to PDSCH								
	EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio	of OCNG to O	CNG DMRS (Note 1)							
		NR_FDD_FR1_A,						116	
		NR_TDD_FR1_A	_	-106				-116 -115.5	
		NR_FDD_FR1_B	_			-88		-11	
	Config	NR_TDD_FR1_C NR_FDD_FR1_D,	_					-1	15
	1,2,4,5	NR_TDD_FR1_D,						-11	4.5
	1,2,4,0	NR_FDD_FR1_E,						- 11	7.0
		NR_TDD_FR1_E						-1	14
		NR_FDD_FR1_G						-1	
λ/ Note2		NR_FDD_FR1_H	-ID /4.51/b.7					-11	
$N_{oc}^{ m Note2}$		NR_FDD_FR1_A,	dBm/15KhZ						
		NR_TDD_FR1_A						-1	16
		NR_FDD_FR1_B						-11	
		NR_TDD_FR1_C						-1	15
	Config 3,6	NR_FDD_FR1_D,		-1	113	-9	94		
	3 - , -	NR_TDD_FR1_D						-11	4.5
		NR_FDD_FR1_E, NR_TDD_FR1_E						1	1.4
		NR_FDD_FR1_G						-1 -1	
		NR FDD FR1 H						-11	
								Sam	
	Config 1,2,4,	5		-1	106	-{	38	Noc/1	
		NR_FDD_FR1_A,							
		NR_TDD_FR1_A						-1	
		NR_FDD_FR1_B						-11	2.5
$N_{oc}^{ m Note2}$		NR_TDD_FR1_C	dBm/SCS					-1	12
1 oc	Config 3,6	NR_FDD_FR1_D,	45/11/300	1	110		91		
	259 0,0	NR_TDD_FR1_D	1	· '	•	`		-11	1.5
		NR_FDD_FR1_E,						4	1.1
		NR_TDD_FR1_E	4			1		-1	
		NR_FDD_FR1_G NR_FDD_FR1_H	-					-1 -10	
	J	INK_FUU_FKI_N	1					-10	უ.ט

$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$			dB	2.5	-6	2.5	-6	0.46	-5.76
$\hat{E}_s/N_{oc}$			dB	6	1	6	1	3	-1
SS-	Config 1,2,4,5	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	NR_TDD_FR1_A  NR_FDD_FR1_B  NR_TDD_FR1_C  NR_FDD_FR1_D,  NR_TDD_FR1_D  NR_FDD_FR1_E,  NR_TDD_FR1_E  NR_FDD_FR1_G  NR_FDD_FR1_H	-105	-82	-87	-113 -112.5 -112 -111.5 -111 -110 -109.5	-117 -116.5 -116 -115.5 -115 -114 -113.5	
RSRP <sup>Note3</sup> Config 3,6	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/SCS	-106	-109	-85	-90	-110 -109.5 109 -108.55 -108 -107 -106.5	-114 -113.5 -113 -112.5 -112 -111 -110.5	
Lo Note3	Config 1,2,4,5	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 9.36MHz	-70	0.09	-52.09		-81 -81 -80	.76 .26 .26
Io <sup>Note3</sup>	Config 3,6	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 38.16MHz	-70.99		-51.99		-76.16 -75.66 -75.16 -74.66 -74.16 -73.16 -72.66	
Propagation		1 22	-			AWC		. , , ,	
Antenna co		e used such that both cell				1x2			

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.4.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in section 10.1.2.1.1 and relative requirement in section 10.1.2.1.2.

# A.4.7.1.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations in Table A.4.7.1.2.1-1.

Table A.4.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only	required to be tested in one of the supported test configurations

### A.4.7.1.2.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.4.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.4.7.1.2.2-1. The inter frequency measurements are supported by a measurement gap.

Table A.4.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Devemeter	Confir	Unit	Test 1		Tes	t 2	
Parameter	Config	Unit	Cell 2	Cell 3	Cell 2	Cell 3	
SSB ARFCN	1~6		freq1	freq2	freq1	freq2	
	1,4		10: N <sub>RB,c</sub> = 52		10: $N_{RB,c} = 52$		
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> =	= 52	10: N <sub>RB</sub>	c = 52	
	3,6		40: N <sub>RB,c</sub> =	106	40: N <sub>RB,0</sub>	= 106	
	1,4		FDD		FD	D	
Duplex mode	2,5		TDD		TD	D	
	3,6		TDD		TD	D	
	1,4		N/A		N/A	4	
TDD configuration	2,5		TDDConf.	.1.1	TDDConf.1.1		
	3,6		TDDConf.2.1		TDDConf.2.1		
	1,4		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Reference measurement channel	2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	
	3,6		SR.2.1 FDD		SR.2.1 FDD		
	1,4		CR.1.1 FDD	-	CR.1.1 FDD	-	
RMSI CORESET Reference Channel	2,5		CR.1.1 TDD	-	CR.1.1 TDD	-	
	3,6		CR.2.1 FDD	-	CR.2.1 FDD	-	
	1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-	
Dedicated CORESET Reference Channel	2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-	
	3,6		CCR.2.1 TDD	-	CCR.2.1 TDD	-	

		1,4		SSB.1 FI	R1	SSB.1	FR1	
SSB config	uration	2,5		SSB.1 FI		SSB.1		
		3,6		SSB.2 FI	R1	SSB.2	FR1	
OCNG Patt	terns	1~6		OP.1		OP		
		1,4		TRS.1.1 FDD		TRS.1.1 FD		
TRS config	uration	2,5		TRS.1.1 TDD -		TRS.1.1 TD		
		3,6		TRS.1.2 TDD	1	TRS.1.2 TDD		
Initial BWP	Configuration	1~6		DLBWP.( ULBWP.(		DLBWP.0.1 ULBWP.0.1		
				DLBWP.		DLBW		
Dedicated I	BWP configuration	1~6		ULBWP.		ULBW		
SMTC conf	figuration	1~6		SMTC.	1	SMT	C.1	
	between Cell 2	1~6	μs	3		3		
and Cell 3			μο		ı	J	ı	
	of PSS to SSS							
SSS SS	of PBCH DMRS to							
	of PBCH to PBCH							
DMRS								
SSS EPRE ratio of	of PDCCH DMRS to							
	of PDCCH to PDCCH					0		
DMRS		1~6	dB	0	0		0	
	of PDSCH DMRS to							
	SSS EPRE ratio of PDSCH to PDSCH							
DMRS								
EPRE ratio of OCNG DMRS to								
SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG								
DMRS Note 1	or ocing to ocing							
	NR_FDD_FR1_A,						4.47	
	NR_TDD_FR1_A, NR_SDL_FR1_A						-117	
	NR_FDD_FR1_B					$(N_{ac})$ for	-116.5	
Note2	NR_TDD_FR1_C		-ID /4.5	04.05			-116	
$N_{oc}$	NR_FDD_FR1_D,	1~6	dBm/15 kHz	-94.65		Channel 2	-115.5	
	NR_TDD_FR1_D		NI IZ			+8dB)	-110.0	
	NR_FDD_FR1_E, NR_TDD_FR1_E					ĺ	-115	
	NR_FDD_FR1_G						-114	
	NR_FDD_FR1_H						-113.5	
	NR_FDD_FR1_A,						4.47	
	NR_TDD_FR1_A, NR_SDL_FR1_A						-117	
	NR_FDD_FR1_B						-116.5	
	NR_TDD_FR1_C			04.65		$(N_{oc} \text{ for }$	-116	
	NR_FDD_FR1_D,	1,2,4,5		-94.65		Channel 2	-115.5	
	NR_TDD_FR1_D					+8dB)	-110.0	
	NR_FDD_FR1_E, NR_TDD_FR1_E					Í	-115	
	NR_FDD_FR1_G						-114	
$N_{oc}$ Note2	NR_FDD_FR1_H		dBm/SS				-113.5	
	NR_FDD_FR1_A,		B SCS				111	
	NR_TDD_FR1_A, NR_SDL_FR1_A						-114	
	NR_FDD_FR1_B						-113.5	
	NR_TDD_FR1_C					( $N_{oc}$ for	-113	
	NR_FDD_FR1_D,	3,6		-91.65		Channel 2	-112.5	
	NR_TDD_FR1_D NR_FDD_FR1_E,					+8dB)		
	NR_TDD_FR1_E						-112	
	NR_FDD_FR1_G						-111	
	NR_FDD_FR1_H					-110.		

	$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~6	dB	10	10	13	-4
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A						-121
	NR_FDD_FR1_B						-120.5
	NR_TDD_FR1_C					(RSRP for	-120
	NR_FDD_FR1_D, NR_TDD_FR1_D	1,2,4,5		-84.65		Cell 2 +25dB)	-119.5
	NR_FDD_FR1_E, NR_TDD_FR1_E						-119
	NR_FDD_FR1_G						-118
SS-	NR_FDD_FR1_H		dBm/SC				-117.5
RSRP <sup>Note3</sup>	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A		S				-124
	NR_FDD_FR1_B						-123.5
	NR_TDD_FR1_C					(RSRP for	-123
	NR_FDD_FR1_D, NR_TDD_FR1_D	3,6		-81.65		Cell 2 +25dB)	-122.5
	NR_FDD_FR1_E, NR_TDD_FR1_E					ŕ	-122
	NR_FDD_FR1_G						-121
	NR_FDD_FR1_H						-120.5
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A		dBm/ 9.36MH z				-87.76
	NR_FDD_FR1_B						-87.26
	NR_TDD_FR1_C			-56.28		(Io for Channel 2 +19.75dB)	-86.76
	NR_FDD_FR1_D, NR_TDD_FR1_D	1,2,4,5					-86.26
	NR_FDD_FR1_E, NR_TDD_FR1_E		_			,	-85.76
	NR_FDD_FR1_G						-84.76
Io <sup>Note3</sup>	NR_FDD_FR1_H						-84.26
10	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A						-84.76
	NR_FDD_FR1_B						-84.26
	NR_TDD_FR1_C		dBm/			(Io for	-83.76
	NR_FDD_FR1_D, NR_TDD_FR1_D	3,6	38.16M Hz	-50.19		Channel 2 +19.75dB)	-83.26
	NR_FDD_FR1_E, NR_TDD_FR1_E		1 12			12,,,000)	-82.76
	NR_FDD_FR1_G						-81.76
	NR_FDD_FR1_H						-81.26
1	$\hat{E}_s/N_{oc}$	1~6	dB	10	10	13	-4
Propag	ation condition	1~6	-	AWGN		AWGN	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.4.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in section 10.1.4.1.1 and Relative requirement in section 10.1.4.1.2.

### A.4.7.1.3 Void

## A.4.7.2 SS-RSRQ

# A.4.7.2.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.7.1.1.

### A.4.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.4.7.2.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in section A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.4.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

Config	Description						
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode						
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode						
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
Note: The UE is only							

Table A.4.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

D		l lmi4	Test 1		Test 2		Test 3			
Parar	neter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3		
SSB ARFCN			free	q1	freq1		free			
Duplay mada	Config 1,4		FDD							
Duplex mode	Config 2,3,5,6		TDD							
	Config 1,4				Not App	olicable				
TDD configuration	Config 2,5			TDDConf.1.1						
	Config 3,6			TDDConf.2.1						
	Config 1,4 10: N <sub>RB,c</sub> = 52									
BW <sub>channel</sub>	Config 2,5	MHz	10: N <sub>RB,c</sub> = 52							
	Config 3,6				40: N <sub>RB</sub> ,	c = 106				
	Initial DL BWP				DLBW	P.0.1				
BWP configuration	Dedicated DL		DLBWP.1.1							
	BWP									
DVVI configuration	Initial UL BWP				ULBW	P.0.1				
	Dedicated UL BWP				ULBW	P.1.1				
DRX Cycle	1 5	ms			Not App	olicable				
•	Config 1,4		SR.1.1		SR.1.1		SR.1.1			
PDSCH Reference	Corning 1,4	_	FDD		FDD		FDD			
measurement	Config 2,5		SR.1.1	-	SR.1.1	-	SR.1.1	-		
channel	_	4	TDD SR2.1		TDD SR2.1		TDD SR2.1			
	Config 3,6		TDD		TDD		TDD			
	Carfin 4.4	1	CR.1.1		CR.1.1		CR.1.1			
RMSI CORESET	Config 1,4	_]	FDD	_	FDD	_	FDD			
Reference Channel	Config 2,5		CR.1.1 TDD	_	CR.1.1 TDD	_	CR.1.1 TDD			

		0		CR.2.1		CR.2.1		CR.2.1				
		Config 3,6		TDD		TDD		TDD				
O a satural A	Ob 1	Config 1,4		CCR.1.1 FDD		CCR.1.1 FDD		CCR.1. 1 FDD				
Control (	Channel	Config 2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-	CCR.1. 1 TDD	-			
		Config 3,6		CCR.2.1 TDD		CCR.2.1 TDD		CCR.2. 1 TDD				
OCNG F				OP. 1								
	I-Measurem	ent		Not Applicable SMTC.1								
STIVIC C	onfigruation	Config 1,2,4,5				SIMI SSB.1						
SSB cor	nfiguration	Config 3,6	-			SSB.2						
PDSCH/PDCCH Config 1,2,4,5		kHz			15 k							
	er spacing	Config 3,6	IXI IZ		Ι	30k	Hz	T	ı			
	io of PSS to S io of PBCH DI											
		PBCH DMRS										
EPRE rat	EPRE ratio of PDCCH DMRS to SSS											
		to PDCCH DMRS	dB	0	0	0	0	0	0			
	EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH											
EPRE rat	EPRE ratio of OCNG DMRS to SSS(Note 1)											
	EPRE ratio of OCNG to OCNG DMRS (Note 1)											
1)	NR_FDD_FR1_A,							[ 10	201			
		NR_TDD_FR1_A						[-120]				
		NR_FDD_FR1_B						[-119.5]				
		NR_TDD_FR1_C	dDm/15k						[-119]			
$N_{oc}$ Note2	2	NR_FDD_FR1_D, NR_TDD_FR1_D	dBm/15k Hz	-9	1	[-110	0.05]	[-118	8.5]			
	NR_FDD_I							[-11	[8]			
		NR_TDD_FR1_E NR_FDD_FR1_G	-					[-11	_			
		NR_FDD_FR1_H						[-116.5]				
	Config 1,2,	4,5		-91		[-11	0.05]	Same as Noc for 15kHz				
		NR_FDD_FR1_A,	<u> </u>									
		NR_TDD_FR1_A						[-117]				
M		NR_FDD_FR1_B	dD/CC					[-116.5]				
$N_{oc}$	Config	NR_TDD_FR1_C NR_FDD_FR1_D,	dBm/SC S					[-116]				
Notez	3,6	NR_TDD_FR1_D		-88	8	[-10	7.05]	[-11	5.5]			
		NR_FDD_FR1_E,						[-11	151			
		NR_TDD_FR1_E										
		NR_FDD_FR1_G NR_FDD_FR1_H	<u> </u>					[-11 [-11;	_			
$\hat{E}_{s}/I_{ot}$			dB	-1.7	76	-4	.7	-5.46	-5.46			
$\hat{E}_s/N_c$	эс		dB	3	3	-2.9	-2.9	-4	-4			
		NR_FDD_FR1_A, NR_TDD_FR1_A						[-124]	[-124]			
		NR_FDD_FR1_B	1					[-	[-			
			-					123.5]	123.5]			
SS- Config	Config	NR_TDD_FR1_C NR_FDD_FR1_D,	dBm/SC	_	_	[- 112.95]	[-	[-123] [-	[-123] [-			
RSRP Note3	1,2,4,5	NR_TDD_FR1_D	S	-88	-88		112.95]	122.5]	122.5]			
		NR_FDD_FR1_E,						[-122]	[-122]			
		NR_TDD_FR1_E	-									
	NR_FDD_FR1_G	]					[-121] [-	[-121] [-				
		NR_FDD_FR1_H						120.5]	120.5]			

	Config 3,6	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H		-85	-85	[- 109.95]	[- 109.95]	[-121]  [- 120.5] [-120] [- 119.5] [-119] [-118] [- 117.5]	[-121]  [- 120.5] [-120] [- 119.5] [-119] [-118] [- 117.5]
SS-RSRQ Note3		NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dB	-14.77	-14.77	-16.76	-16.76	[- 17.34]	[- 17.34]
IoNote3	Config 1,2,4,5	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 9.36MHz	-5	6	[-79]		[-89.5] [-89] [-88.5] [-88] [-87.5] [-86.5] [-86]	
10	Config 3,6	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 38.16M Hz	-50.00		[-73]		[-83.41] [-82.91] [-82.41] [-81.91] [81.41] [80.41] [-79.91]	
Propagation condition		-	AWGN	AWG N	AWGN	AWGN	AWGN	AWG N	
Antenna	configuratio	n		1x2	1x2	1x2	1x2	1x2	1x2

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Section 3.5.2.

### A.4.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.7.1.1.

# A.4.7.2.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter frequency measurement.

#### A.4.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.4.7.2.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.4.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only re	equired to be tested in one of the supported test configurations

Table A.4.7.2.2.2: SS-RSRQ Inter frequency test parameters

Danam	-1	l lmi4	Tes	st 1	Test 2		Test 3		
Parame	eter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3	
SSB ARFCN			freq1 freq2 freq1 freq2 freq1					freq2	
Duplex mode	Config 1,4		FDD						
Вирюх пюче	Config 2,3,5,6				TD				
	Config 1,4				Not App	licable			
TDD configuration	Config 2,5				TDDCo	nf.1.1			
	Config 3,6				TDDCo	nf.2.1			
	Config 1,4				10: N <sub>RB</sub>	<sub>.c</sub> = 52			
BW <sub>channel</sub>	Config 2,5	MHz			10: N <sub>RB</sub>	<sub>,c</sub> = 52			
	Config 3,6				40: N <sub>RB,0</sub>	= 106			
	Config 1,4		10: N <sub>RB,c</sub> = 52						
BWP BW	Config 2,5	MHz	MHz 10: N <sub>RB,c</sub> = 52						
	Config 3,6		40: N <sub>RB,c</sub> = 106						
DRX Cycle		ms			Not App	licable			
	Config 1,4		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Reference measurement channel	Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-	
	Config 3,6		SR.2.1 TDD		SR.2.1 TDD		SR.2.1 TDD		
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-	

-			,				1		
		Config 2,5		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
		Config 3,6		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	
		Config 1,4		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1 .1 FDD	
Dedicated Reference	CORESET Channel	Config 2,5		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1 .1 TDD	-
		Config 3,6		CCR.2. 1 TDD		CCR.2. 1 TDD		CCR.2 .1 TDD	
OCNG Patterns						OCNG pa	attern 1		
OMITO	· ·	Config 1,2,4,5				SMTC pa	attern 1		
SMTC con	figuration	Config 3,6				SMTC pa			
SSB confi	guration	Config 1,2,4,5			5	SB patter			
SSB COIIII	guration	Config 3,6			5	SSB patter	n 2 in FR1		
PDSCH/PI	DCCH	Config 1,2,4,5	k⊔∍			15 k	Hz		
subcarrier	spacing	Config 3,6	kHz		<u> </u>	30 k	Hz		
	of PSS to SSS								
	of PBCH DMRS								
	of PBCH to PBO of PDCCH DMF		-						
	of PDCCH to PI		dB	0	0	0	0	0	0
EPRE ratio	EPRE ratio of PDSCH DMRS to SSS								
	EPRE ratio of PDSCH to PDSCH								
	EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)		-						
27.712.744.0		NR_FDD_FR1_A			I				
		NR_TDD_FR1_A		-80.18					
		NR_SDL_FR1_A						-116	
		NR_FDD_FR1_B				-106		-115.5	
$N_{oc}$ Note2	Config	NR_TDD_FR1_C NR_FDD_FR1_D	dBm/15kH					-115	
IV <sub>oc</sub>	1,2,4,5	NR_TDD_FR1_D	z					-114.5	
		NR_FDD_FR1_E						-114.5	
		NR_TDD_FR1_E						-11	14
		NR_FDD_FR1_G						-11	13
		NR_FDD_FR1_H						-11	2.5
		NR_FDD_FR1_A NR_TDD_FR1_A							
		NR_SDL_FR1_A						-1	16
		NR_FDD_FR1_B						-11:	
		NR_TDD_FR1_C	dDm/15kU					-11	
$N_{oc}$ Note2	Config 3,6	NR_FDD_FR1_D	dBm/15kH z	-86	5.27	-1	13		
		NR_TDD_FR1_D						-11	4.5
		NR_FDD_FR1_E							
		NR_TDD_FR1_E NR_FDD_FR1_G						-1 <sup>2</sup>	
		NR_FDD_FR1_H						-11:	
		NR_FDD_FR1_A							
		NR_TDD_FR1_A							
		NR_SDL_FR1_A						-11	
$N_{oc}$ Note2	Config	NR_FDD_FR1_B		0.0	1 1 0	4	06	-11:	
IV <sub>oc</sub>	1,2,4,5	NR_TDD_FR1_C NR_FDD_FR1_D	dBm/SCS	-80	).18	-1	06	-11	10
		NR_TDD_FR1_D						-11-	4.5
		NR_FDD_FR1_E	1						<del>-</del>
		NR_TDD_FR1_E						-114	

	NR_FDD_FR1_G						-1	13
	NR_FDD_FR1_H						-11	2.5
	NR_SDL_FR1_A						-1	13
	NR_FDD_FR1_B						-11	
Config 3.6			92	27	1	10	-1	12
Coming 3,6	NR_TDD_FR1_D		-03	.21	-1	10	-111.5	
	NR_FDD_FR1_E NR_TDD_FR1_E						-1	11
	NR_FDD_FR1_G						-110 -109.5	
	NK_1 00_1 K1_11	dB	-1.	75	-1	.75	3	-1.75
		dB	-1.	75	-1	.75	3	-1.75
	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A						-113	- 117.75
	NR_FDD_FR1_B						-112.5	- 117.25
Config	NR_TDD_FR1_C						-112	- 116.75
1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D		-81.93	-81.93	107.75	-107.75	-111.5	- 116.25
	NR_FDD_FR1_E NR_TDD_FR1_E						-111	- 115.75
	NR_FDD_FR1_G						-110	- 114.75
	NR_FDD_FR1_H	dBm/SCS					-109.5	- 114.25
	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A	dbiii/303		-85.02	- 111.75	-111.75	-110	- 114.75
	NR_FDD_FR1_B						-109.5	- 114.25
	NR_TDD_FR1_C						-109	- 113.75
Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D		-85.02				-108.5	- 113.25
	NR_FDD_FR1_E NR_TDD_FR1_E						-108	- 112.75
	NR_FDD_FR1_G						-107	- 111.75
	NR_FDD_FR1_H						-106.5	- 111.25
Note3	NR_FDD_FR1_A NR_TDD_FR1_B NR_FDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_G	NR_FDD_ FR1_A NR_TDD_ FR1_A NR_SDL_ FR1_A NR_FDD_ FR1_B NR_TDD_ FR1_C	-14.77	-14.77	-40.59	-40.59	-12.56	- 14.76
	Config 1,2,4,5	NR_FDD_FR1_H	NR_FDD_FR1_H	NR_FDD_FR1_H   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_F	NR_FDD_FR1_H   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_F	NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_FDD_FR1_D   NR_FDD_FR1_E   NR_FDD_FR1_B   NR_F	NR FDD FR1   H NR FDD FR1   A NR SDL FR1   A NR FDD FR1   B NR TDD FR1   D NR FDD FR1   B NR FDD FR1   A NR SDL FR1   A NR SDL FR1   A NR SDL FR1   A NR SDL FR1   A NR FDD FR1   B NR TDD FR1   B NR TDD FR1   B NR TDD FR1   B NR FDD FR1   B NR F	NR FDD_FR1_A   NR FDD_FR1_A   NR FDD_FR1_B   NR F

			NR_TDD_ FR1_D						
			NR_FDD_ FR1_E NR_TDD_ FR1_E						
			NR_FDD_ FR1_G						
			NR_FDD_ FR1_H						
		NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A						- 83.28	- 85.83
		NR_FDD_FR1_B						- 82.78	- 85.33
Config	NR_TDD_FR1_C	dBm/					- 82.28	- 84.83	
	1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D	9.36MHz	-50		-75.83		- 81.78	- 84.33
		NR_FDD_FR1_E NR_TDD_FR1_E						- 81.28	- 83.83
		NR_FDD_FR1_G						- 80.28	- 82.83
lo <sup>Note3</sup>		NR_FDD_FR1_H						- 79.78	- 82.33
		NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A						- 77.19	- 79.73
		NR_FDD_FR1_B						- 76.69	- 79.23
		NR_TDD_FR1_C	dBm/					- 76.19	- 78.73
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D	38.16MHz	-5	50	-76	5.73	- 75.69	- 78.23
		NR_FDD_FR1_E NR_TDD_FR1_E						- 75.19	- 77.73
		NR_FDD_FR1_G						- 74.19	- 76.73
		NR_FDD_FR1_H						73.69	76.53
Propagation	on condition		-	AWGN	AWGN	AWGN	AWGN	AWG N	AWG N

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Section 3.5.2.

### A.4.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.9.1.1 and 10.1.9.1.2.

### A.4.7.3 SS-SINR

# A.4.7.3.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

#### A.4.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.4.7.3.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in section A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.4.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

(	Config	Description
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.4.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parame	ntor	Unit	Tes	st 1	Test 2				
Parame	etei	Onit	Cell 2	Cell 3	Cell 2	Cell 3			
SSB ARFCN			fre	q1	free	ղ1			
Duplex mode	Config 1,4			FDD					
Duplex mode	Config 2,3,5,6			TI	DD				
	Config 1,4			Not Ap	plicable				
TDD configuration	Config 2,5			TDDC	onf.1.1				
	Config 3,6			TDDC	onf.2.1				
Downlink initial BWP cor	nfiguration			DLBV	VP.0.1				
Downlink dedicated BWI				DLBV	VP.1.1				
Uplink initial BWP config	uration			ULBV	VP.0.1				
Uplink dedicated BWP c				ULBWP.1.1					
DRX Cycle configuration		ms		Not Applicable					
	Config 1, 4		TRS.1.1 FDD						
TRS configuration	Config 2, 5		TRS.1.1 TDD						
	Config 3, 6			TRS.1.2 TDD					
	Config 1,4		SR.1.1 FDD		SR.1.1 FDD				
PDSCH Reference measurement channel	Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-			
	Config 3,6		SR.2.1 TDD		SR2.1 TDD				
	Config 1,4		CR.1.1 FDD		CR.1.1 FDD				
RMSI CORESET Reference Channel	Config 2,5		CR.1.1 TDD	-	CR.1.1 TDD				
	Config 3,6		CR.2.1 TDD		CR.2.1 TDD				
	Config 1,4		CCR.1. 1 FDD	-	CCR.1.1 FDD	-			

Dedicated	CORESET	Config 2,5		CCR.1. 1 TDD		CCR.1.1 TDD		
Reference		Config 3,6		CCR.2. 1 TDD		CCR.2.1		
OCNG Pat		I.		1100	O	P.1		
	Measurement					plicable		
SMTC con	figruation	Config 1,2,4,5			SMTC.1 SSB.1 FR1			
SSB config	guration	Config 3,6		SSB.1 FR1				
PDSCH/PI	DCCH	Config 1,2,4,5	1.11=	15				
subcarrier		Config 3,6	kHz		3	30		
	EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS							
	EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio	of PDCCH DMF	RS to SSS						
	of PDCCH to Pl of PDSCH DMF		dB	0	0	0	0	
	of PDSCH to PI							
EPRE ratio	of OCNG DMR	S to SSS(Note 1)						
EPRE ratio	of OCNG to OC	NG DMRS (Note 1)				[-11	61	
	NR_FDD_FR1_A,   NR_TDD_FR1_A					[-11	oj	
		NR_FDD_FR1_B				[-11	5.5]	
		NR_TDD_FR1_C				[-115]		
$N_{ac}$ Note2		NR_FDD_FR1_D,	dBm/15kH	[-9	90]	[-114.5]		
		NR_TDD_FR1_D NR_FDD_FR1_E,	Z	-	-	[-11	41	
		NR_TDD_FR1_E					' ' 1	
	NR_FDD_FR1_G					[-11		
	T	NR_FDD_FR1_H				[-112		
	Config 1,2,4			[-9	90]	Same as Noc for 15kHz		
		NR_FDD_FR1_A, NR_TDD_FR1_A				[-113]		
		NR_FDD_FR1_B	dBm/SCS			[-112.5]		
$N_{oc}$		NR_TDD_FR1_C				[-11	2]	
Note2	Config 3,6	NR_FDD_FR1_D,	abiii, ccc	[-8	37]	[-11 <sup>-</sup>	1.5]	
		NR_TDD_FR1_D NR_FDD_FR1_E,						
		NR_TDD_FR1_E				[-11	1]	
		NR_FDD_FR1_G				[-11	_	
-		NR_FDD_FR1_H	15	ro1		[-109		
$\hat{\mathbf{E}}_{s}/\mathbf{I}_{ot}$			dB	[0]	[-3.19]	[-5.46]		
$\hat{E}_s/N_{oc}$		NR_FDD_FR1_A,	dB	[4.54]	[2.66]	[-4]	[-4]	
		NR_TDD_FR1_A				[-120]	[-120]	
		NR_FDD_FR1_B				[-119.5]	[- 119.5]	
	0 "	NR_TDD_FR1_C				[-119]	[-119]	
	Config 1,2,4,5	NR_FDD_FR1_D, NR_TDD_FR1_D		[- 85.46]	[-87.34]	[-118.5]	[- 118.5]	
SS- RSRP <sup>Not</sup>		NR_FDD_FR1_E, NR_TDD_FR1_E	dBm/SCS			[-118]	[-118]	
e3		NR_FDD_FR1_G				[-117]	[-117]	
		NR_FDD_FR1_H				[-116.5]	[- 116.5]	
		NR_FDD_FR1_A, NR_TDD_FR1_A		-		[-117]	[-117]	
	Config 3,6	NR_FDD_FR1_B		[- 82.46]	[-84.34]	[-116.5]	[- 116.5]	
		NR_TDD_FR1_C				[-116]	[-116]	

		NR_FDD_FR1_D,				[ 115 5]	[-	
		NR_TDD_FR1_D				[-115.5]	115.5]	
		NR_FDD_FR1_E,				[-115]	[-115]	
		NR_TDD_FR1_E				' '		
		NR_FDD_FR1_G				[-114]	[-114]	
		NR_FDD_FR1_H				[-113.5]	[-	
							113.5]	
		NR_FDD_FR1_A,						
		NR_TDD_FR1_A						
		NR_FDD_FR1_B	-					
		NR_TDD_FR1_C						
SS-SINR N	ote3	NR_FDD_FR1_D,	dB	[0]	[-3.19]	[-5.46]	[-5.46]	
		NR_TDD_FR1_D NR_FDD_FR1_E,						
		NR_TDD_FR1_E						
		NR_FDD_FR1_G						
		NR_FDD_FR1_H						
		NR_FDD_FR1_A,				[-85	511	
		NR_TDD_FR1_A				[ 00.	.01]	
		NR FDD FR1 B				[-85.	.011	
		NR_TDD_FR1_C				[-84.	-	
	Config	NR_FDD_FR1_D,	dBm/	[-54.5]		[-84.01]		
	1,2,4,5	NR_TDD_FR1_D	9.36MHz					
		NR_FDD_FR1_E,				[-83.51]		
		NR_TDD_FR1_E				[		
		NR_FDD_FR1_G	]			[-82.51]		
Io <sup>Note3</sup>		NR_FDD_FR1_H	]			[-82.	.01]	
10.10.00		NR_FDD_FR1_A,				[-79	.41]	
		NR_TDD_FR1_A						
		NR_FDD_FR1_B				[-78.	.91]	
		NR_TDD_FR1_C				[-78.	.41]	
	Config 3,6	NR_FDD_FR1_D,	dBm/	[_/18	3.41]	[-77.	.91]	
Coning 3,	Coming 5,0	NR_TDD_FR1_D	38.16MHz	[-40	,. <del>,</del> , ]			
		NR_FDD_FR1_E,				[-77.	.41]	
		NR_TDD_FR1_E						
		NR_FDD_FR1_G				[-76	-	
5 0 10		NR_FDD_FR1_H				[-75.	.91]	
	Propagation condition				AWGN			
	onfiguration	a used such that both		<u> </u>		x2		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Section 3.5.2.

### A.4.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in section 10.1.12.1.1.

# A.4.7.3.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.1.1 and 10.1.14.1.2 for inter frequency measurement.

#### A.4.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.4.7.3.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.4.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

Config	Description							
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode							
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode							
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode							
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode							
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode							
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode							
Note: The UE is only								

Table A.4.7.3.2.2-1: SS-SINR Inter frequency test parameters

Danam		Unit	Tes	st 1	Test 2		Test 3				
Param	eter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3			
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2			
Duplex mode	Config 1,4				F	DD					
Duplex mode	Config 2,3,5,6		TDD								
	Config 1,4				Not Ap	plicable					
TDD configuration	Config 2,5				TDDC	onf.1.1					
	Config 3,6				TDDC	onf.2.1					
Downlink initial BWP cor	k initial BWP configuration DLBWP.0.1										
Downlink dedicated BW	Downlink dedicated BWP configuration				DLBWP.1.1						
Uplink initial BWP config	Uplink initial BWP configuration			ULBWP.0.1							
Uplink dedicated BWP of	onfiguration		ULBWP.1.1								
DRX Cycle configuration	1	ms	Not Applicable								
	Config 1, 4				TRS.1	.1 FDD					
TRS configuration	Config 2, 5				TRS.1	.1 TDD					
	Config 3, 6				TRS.1	.2 TDD					
	Config 1,4		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD				
PDSCH Reference measurement channel	Config 2,5		SR.1.1 TDD	_	SR.1.1 TDD	-	SR.1.1 TDD	-			
	Config 3,6		SR.2.1 TDD		SR.2.1 TDD		SR.2.1 TDD				

			•	,	,			•	
		Config 1,4		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD	
RMSI COR Reference		Config 2,5	-	CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-
		Config 3,6	1	CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	
		Config 1,4		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD	
Dedicated Reference	CORESET Channel	Config 2,5		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-
		Config 3,6	-	CCR.2. 1 TDD		CCR.2. 1 TDD		CCR.2. 1 TDD	
OCNG Pat	terns					0	P.1		
SS-RSSI-N	/leasurement					Not Ap	plicable		
SMTC con	figruation						TC.1		
		Config 1,2,4,5					1 FR1		
SSB config	guration	Config 3,6	1				2 FR1		
		Config 1,2,4,5					15		
PDSCH/PI subcarrier		Config 3,6	kHz						
		Corning 3,6			I	;	30	I	
FPRE ratio	of PSS to SSS of PBCH DMRS	S to SSS		dB 0	0	0	0		
	of PBCH to PB		1					0	0
	of PDCCH DMF		]						
	of PDCCH to P		dB						
	of PDSCH DMF of PDSCH to P		4						
		S to SSS(Note 1)	†						
		CNG DMRS (Note 1)							
		NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A				[-108.5]		[-11	19.5]
$N_{oc}$	Config	NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D	dBm/15k	Γ_5	RO1			[-11	19] [8.5]
Note2	1,2,4,5	NR_TDD_FR1_D NR_FDD_FR1_E	Hz -	[-80]		[-106.5]		_	18]
		NR_TDD_FR1_E NR_FDD_FR1_G	-					[-117.5] [-116.5]	
	Co	NR_FDD_FR1_H nfig 1,2,4,5		]-8	30]	[-10	8.5]	Same a	s Noc for
		NR_FDD_FR1_A	_	[-0	JO]	[-105.5]			kHz
$N_{oc}$ Note2	Config 3,6	NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E	dBm/SC S	[-7	77]			[-1 [-1 <sup>2</sup>	16.5] 16] 15.5] 15]
		NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	-					[-1]	14.5] 13]

$\hat{\mathbf{E}}_{\scriptscriptstyle \mathrm{s}}/\mathbf{I}_{\scriptscriptstyle \mathrm{ot}}$			dB	[-1.75]	[20]	[-4.0]
$\hat{E}_s/N_{oc}$			dB	[-1.75]	[20]	[-4.0]
SS-	Config 1,2,4,5	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/SC	[-81.75]	[-88.5]	[-123.5]  [-123] [-122.5]  [-122]  [-121.5]  [-120.5]
RSRP <sup>Not</sup> e3	Config 3,6	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	S	[-78.75]	[-85.5]	[-120.5]  [-120] [-119.5]  [-119]  [-118.5]  [-117.5]
NR   NR   NR   NR   NR   NR   NR   NR		NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dB	[-1.75]	[20]	[-4.0]
Io <sup>Note3</sup>	Config 1,2,4,5	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 9.36MHz	[-49.83]	[-60.5]	[-90.09] [-89.59] [-89.09] [-88.59] [-88.09] [-87.09] [-86.59]
10.000	Config 3,6	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 38.16MH z	[-43.73]	[-54.41]	[-84] [-83.5] [-83] [-82.5] [-82] [-81] [-80.5]

Propagat	Propagation condition		AWGN		
Antenna	configuration	-	1x2		
Note 1:	OCNG shall be used such that both density is achieved for all OFDM syl		ly allocated and a constant total transmitted power spectral		
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{col}$ to be fulfilled.				
Note 3:	: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4:	$\cdot$				
Note 5:	NR operating band groups are as de	efined in Sec	ction 3.5.2.		

### A.4.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in section 10.1.14.1.1 and 10.1.14.1.2.

## A.4.7.4 L1-RSRP measurement for beam reporting

## A.4.7.4 L1-RSRP measurement for beam reporting

### A.4.7.4.1 SSB based L1-RSRP measurement

### A.4.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 9.5.2 and section 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.4.7.4.1.1-1.

Table A.4.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

Config	Description						
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode						
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode						
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode						
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
Note: The UE is only re	Note: The UE is only required to be tested in one of the supported test configurations						

### A.4.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.4.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
	1,4		FDD	FDD
Duplex mode	2,5		TDD	TDD
	3,6		TDD	TDD

		1,4		N/A	N/A
TDD Configuration		2,5		TDDConf.1.1	TDDConf.1.1
		3,6	1	TDDConf.2.1	TDDConf.2.1
		1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BWchanne	al .	2,5	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
		3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
DDCCII	Deference	1,4		SR.1.1 FDD	SR.1.1 FDD
	Reference ement channel	2,5		SR.1.1 TDD	SR.1.1 TDD
illeasure	anient channer	3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CO	ORESET Reference	1,4		CR.1.1 FDD	CR.1.1 FDD
Channel		2,5		CR.1.1 TDD	CR.1.1 TDD
		3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicate	ed CORESET	1,4		CCR.1.1 FDD	CCR.1.1 FDD
Reference	ce Channel	2,5	-	CCR.1.1 TDD	CCR.1.1 TDD
		3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB oon	figuration	1,4	_	SSB.3 FR1 SSB.3 FR1	SSB.3 FR1 SSB.3 FR1
335 (01)	iliguration	2,5 3,6	+	SSB.4 FR1	SSB.4 FR1
OCNG P	Pattorns	1~6		OP.1	OP.1
OCIVOT	allerris	1,4		TRS.1.1 FDD	TRS.1.1 FDD
TRS con	figuration	2,5	†	TRS.1.1 TDD	TRS.1.1 TDD
1110 0011	ingulation	3,6	1	TRS.1.2 TDD	TRS.1.2 TDD
1 ::: 1 D)	VD 0 . " ".			DLBWP.0.1	DLBWP.0.1
initiai BV	VP Configuration	1~6		ULBWP.0.1	ULBWP.0.1
Dodicato	ed BWP configuration	1~6		DLBWP.1.1	DLBWP.1.1
				ULBWP.1.1	ULBWP.1.1
	onfiguration	1~6		SMTC.1	SMTC.1
	onfigType	1~6		periodic	periodic
reportQu		1~6		ssb-Index-RSRP	ssb-Index-RSRP
	of reported RS	1~6		2	2
	P reporting period o of PSS to SSS	1~6		slot80	slot80
	o of PBCH DMRS to SSS				
EPRE ratio	o of PBCH to PBCH DMRS				
	o of PDCCH DMRS to SSS				
DMRS	o of PDCCH to PDCCH				
	o of PDSCH DMRS to SSS	1~6	dB	0	0
EPRE ratio	o of PDSCH to PDSCH				
DMRS	4 OONO DMDO 4-				
SSS <sup>Note 1</sup>	o of OCNG DMRS to				
	o of OCNG to OCNG				
DIVING ***	NR_FDD_FR1_A,				-117
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				-116.5
$N_{oc}$	NR_TDD_FR1_C				-116
Note2	NR_FDD_FR1_D, NR_TDD_FR1_D	1~6	dBm/15kHz	-94.65	-115.5
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				-117
N	NR_TDD_FR1_A		dBm/SSB		11C F
$N_{oc}$	NR_FDD_FR1_B NR_TDD_FR1_C	1,2,4,5	SCS	-94.65	-116.5 -116
Note2					-110
140102	NR FDD FR1 D				
Note	NR_FDD_FR1_D, NR_TDD_FR1_D				-115.5

	<u> </u>			T	
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E	-			
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H NR_FDD_FR1_A,		-		-113.5
	NR_FDD_FR1_A,				-114
	NR FDD FR1 B	-			-113.5
	NR TDD FR1 C	1			-114
	NR_FDD_FR1_D,	1			
	NR_TDD_FR1_D	3,6		-91.65	-112.5
	NR_FDD_FR1_E,				-112
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				-111
	NR_FDD_FR1_H				-110.5
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		1~6	dB	10	-3
57 00	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				-120
	NR_FDD_FR1_B				-119.5
	NR_TDD_FR1_C	]			-119
	NR_FDD_FR1_D,	1,2,4,5		-84.65	-118.5
	NR_TDD_FR1_D	3,6	dBm/SSB SCS	-04.03	110.0
	NR_FDD_FR1_E,				-118
	NR_TDD_FR1_E NR_FDD_FR1_G				-117
SSB	NR_FDD_FR1_H				-116.5
RSRP	NR_FDD_FR1_A,				
Note3	NR_TDD_FR1_A				-117
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C				-116
	NR_FDD_FR1_D,			-81.65	-115.5
	NR_TDD_FR1_D				-110.0
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E	-			
	NR_FDD_FR1_G NR_FDD_FR1_H	-			-114 -113.5
	NR_FDD_FR1_H NR_FDD_FR1_A,				-113.3
	NR_TDD_FR1_A				-87.28
	NR FDD FR1 B		dBm/9.36 MHz	-56.28	-86.78
	NR_TDD_FR1_C	1			-86.28
	NR_FDD_FR1_D,	1215			
	NR_TDD_FR1_D	1,2,4,5			-85.78
	NR_FDD_FR1_E,				-85.28
	NR_TDD_FR1_E	-			
	NR_FDD_FR1_G	-			-84.28
lo Note3	NR_FDD_FR1_H				-83.78
	NR_FDD_FR1_A, NR_TDD_FR1_A				-81.19
	NR_FDD_FR1_B				-80.69
	NR_TDD_FR1_C				-80.19
	NR_FDD_FR1_D,	2.0	dBm/38.16	FO 40	
	NR_TDD_FR1_D	3,6	MHz	-50.19	-79.69
	NR_FDD_FR1_E,				-79.19
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				-78.19
<u> </u>	NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_o$	c	1~6	dB	10	-3
Propagat	tion condition	1~6		AWGN	AWGN

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power
	for $N_{oc}$ to be fulfilled.
Note 3:	RSRP and lo levels have been derived from other parameters for information purposes.
	They are not settable parameters themselves.
Note 4:	RSRP minimum requirements are specified assuming independent interference and noise
	at each receiver antenna port.

### A.4.7.4.1.3 Test Requirements

For at least one reported L1-RSRP during 480ms, the accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in sections 10.1.19.1.

### A.4.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

### A.4.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 9.5.3 and section 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.4.7.4.2.1-1.

Table A.4.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

Config	Description						
1	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode						
2	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode						
3	LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode						
4	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode						
5	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode						
6	LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode						
Note: The UE is only	Note: The UE is only required to be tested in one of the supported test configurations						

### A.4.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.4.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
	1,4		FDD	FDD
Duplex mode	2,5		TDD	TDD
	3,6		TDD	TDD
	1,4		N/A	N/A
TDD Configuration	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
BW <sub>channel</sub>	1,4	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
DVV channel	2,5	IVII IZ	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52

		3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
		1,4		SR.1.1 FDD	SR.1.1 FDD
	Reference	2,5		SR.1.1 TDD	SR.1.1 TDD
measure	measurement channel		-	SR.2.1 TDD	SR.2.1 TDD
		3,6 1,4		CR.1.1 FDD	CR.1.1 FDD
	DRESET Reference	2,5		CR.1.1 TDD	CR.1.1 TDD
Channel		3,6		CR.2.1 TDD	CR.2.1 TDD
		1,4		CCR.1.1 FDD	CCR.1.1 FDD
	d CORESET	2,5		CCR.1.1 TDD	CCR.1.1 TDD
Reference	ce Channel	3,6		CCR.2.1 TDD	CCR.2.1 TDD
		1,4		SSB.1 FR1	SSB.1 FR1
SSB conf	figuration	2,5		SSB.1 FR1	SSB.1 FR1
000 0011	nguradon	3,6		SSB.2 FR1	SSB.2 FR1
OCNG P	atterns	1~6		OP.1	OP.1
001101	attorno	1,4		TRS.1.1 FDD	TRS.1.1 FDD
TRS conf	figuration	2,5	1	TRS.1.1 TDD	TRS.1.1 TDD
1110 0011	nguration	3,6		TRS.1.2 TDD	TRS.1.2 TDD
				DLBWP.0.1	DLBWP.0.1
Initial BW	/P Configuration	1~6		ULBWP.0.1	ULBWP.0.1
<del>                                     </del>				DLBWP.1.1	DLBWP.1.1
Dedicate	d BWP configuration	1~6		ULBWP.1.1	ULBWP.1.1
SMTC co	onfiguration	1~6		SMTC.1	SMTC.1
SIVITO CC	Amguration	1,4		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
CSI-RS		2,5		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
001-110		3,6	-	CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportCo	nfigType	1~6		periodic	periodic
reportQu		1~6		cri-RSRP	cri-RSRP
	of reported RS	1~6		2	2
	reported No	1~6		slot80	slot80
	o of PSS to SSS	1~0		310100	310100
	o of PBCH DMRS to SSS				
EPRE ratio	o of PBCH to PBCH DMRS				
EPRE ratio	o of PDCCH DMRS to SSS				
	o of PDCCH to PDCCH				
DMRS EPRE ratio	o of PDSCH DMRS to SSS	1~6	dB	0	0
FPRF ratio	o of PDSCH to PDSCH	1~0	QD	O O	
DMRS					
	o of OCNG DMRS to				
SSS <sup>Note 1</sup>	(0010) 0010				
DMRS Note	o of OCNG to OCNG				
2	NR_FDD_FR1_A,				4
	NR_TDD_FR1_A				-117
	NR FDD FR1 B				-116.5
<b>N</b> 7	NR_TDD_FR1_C				-116
$N_{oc}$	NR_FDD_FR1_D,	4.0	ID /4=:::	04.05	_
Note2	NR_TDD_FR1_D	1~6	dBm/15kHz	-94.65	-115.5
	NR_FDD_FR1_E,				445
	NR_TDD_FR1_E				-115
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				-117
		1			-116.5
	NR_FDD_FR1_B	-			
N/	NR_FDD_FR1_B NR_TDD_FR1_C		-ID (CC) -DC		-116
$N_{oc}$		1,2,4,5	dBm/CSI-RS	-94.65	
$N_{oc}$ Note2	NR_TDD_FR1_C	1,2,4,5	dBm/CSI-RS SCS	-94.65	-116 -115.5
	NR_TDD_FR1_C NR_FDD_FR1_D,	1,2,4,5		-94.65	-115.5
	NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D	1,2,4,5		-94.65	

	NR FDD FR1 H				-113.5
	NR_FDD_FR1_H				-113.5
	NR_TDD_FR1_A				-114
	NR FDD FR1 B				-113.5
	NR TDD FR1 C				-114
	NR_FDD_FR1_D,			04.0=	
	NR_TDD_FR1_D	3,6		-91.65	-112.5
	NR_FDD_FR1_E,				440
	NR_TDD_FR1_E				-112
	NR_FDD_FR1_G				-111
	NR_FDD_FR1_H				-110.5
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		1~6	dB	TBD	10
	NR_FDD_FR1_A,				-120
	NR_TDD_FR1_A				-120
	NR_FDD_FR1_B				-119.5
	NR_TDD_FR1_C				-119
	NR_FDD_FR1_D,	1,2,4,5		-84.65	-118.5
	NR_TDD_FR1_D	.,_,.,•		2	
	NR_FDD_FR1_E,				-118
	NR_TDD_FR1_E NR_FDD_FR1_G				-117
CSI-RS	NR FDD FR1 H		dBm/CSI-RS SCS		-116.5
RSRP	NR_FDD_FR1_A,				
Note3	NR_TDD_FR1_A	3,6			-117
	NR_FDD_FR1_B				-116.5
	NR TDD FR1 C				-116
	NR_FDD_FR1_D,			04.05	
	NR_TDD_FR1_D			-81.65	-115.5
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				-113
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				-87.28
	NR_TDD_FR1_A		dBm/9.36 MHz	-56.28	00.70
	NR_FDD_FR1_B NR_TDD_FR1_C				-86.78 -86.28
	NR_FDD_FR1_D,				-00.20
	NR_TDD_FR1_D	1,2,4,5			-85.78
	NR FDD FR1 E,				
	NR_TDD_FR1_E				-85.28
	NR_FDD_FR1_G				-84.28
lo Note3	NR_FDD_FR1_H				-83.78
10	NR_FDD_FR1_A,				-81.19
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				-80.69
	NR_TDD_FR1_C		ID /22 /2		-80.19
	NR_FDD_FR1_D, NR_TDD_FR1_D	3,6	dBm/38.16	-50.19	-79.69
	NR_FDD_FR1_E,		MHz		
	NR_TDD_FR1_E,				-79.19
	NR_FDD_FR1_G				-78.19
	NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_o$		1~6	dB	10	-3
	ion condition	1~6		AWGN	AWGN
Tiopayal	OCNO shall be used a	1~0		AVVGIN	AWGIN

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power
	for $N_{oc}$ to be fulfilled.
Note 3:	RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port

### A.4.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in sections 10.1.19.2.

## A.4.7.5 SFTD accuracy

## A.4.7.5.1 SFTD accuracy

### A.4.7.5.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in section 9.1.27 in TS 36.133 [15] for EN-DC SFTD measurements.

#### A.4.7.5.1.2 Test Parameters

Supported test configurations are shown in Table A.4.7.5.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is NR FR1 PSCell. The test parameters of cell 1 are given in section A.3.7.2.1. The test parameters of cell 2 are given in Table A.4.7.5.1.2-2. The SFTD between PCell and PSCell shall be set by the test equipment to one of the time differences in Table A.4.7.5.1.2-3.

Table A.4.7.5.1.2-1: Supported test configurations for SFTD accuracy

Configuration	Description				
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD				
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD				
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD				
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD				
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD				
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD				
Note: The UE is or	e: The UE is only required to be tested in one of the supported test configurations				

Table A.4.7.5.1.2-2: Test parameters for SFTD accuracy

Parameter	Config	Unit	Test 1
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
	3,6		TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106
	1,4		SR.1.1 FDD
PDSCH Reference measurement channel	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD

			1		
RMSI CORESET Reference Channel		1,4	_	CR.1.1 FDD	
		2,5	_	CR.1.1 TDD	
		3,6		CR.2.1 TDD	
RMC CORESET Reference Channel		1,4	_	CCR.1.1 FDD	
		2,5	_	CCR.1.1 TDD	
		3,6		CCR.2.1 TDD	
		1,4		SSB.1 FR1	
SSB configu	ration	2,5		SSB.1 FR1	
		3,6		SSB.2 FR1	
SMTC config		1~6		SMTC.1	
DL BWP cor		1~6		DLBWP.1.1	
UL BWP cor	· ·	1~6		ULBWP.1.1	
OCNG Patte		1~6		OP.1	
	of PSS to SSS				
	of PBCH DMRS to SSS				
	of PBCH to PBCH DMRS				
	of PDCCH DMRS to SSS	_			
EPRE ratio	of PDCCH to PDCCH DMRS	1~6	dB	0	
EPRE ratio	of PDSCH DMRS to SSS				
	of PDSCH to PDSCH DMRS				
	of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio	of OCNG to OCNG DMRS Note 1				
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				
	NR_TDD_FR1_C				
$N_{oc}^{ m Note2}$	NR_FDD_FR1_D,	1~6	dBm/15kHz	-104	
1 oc	NR_TDD_FR1_D	_	dBilly Toki 12	104	
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				
	NR_FDD_FR1_G	-			
	NR_FDD_FR1_H				
	NR_FDD_FR1_A, NR_TDD_FR1_A				
	NR FDD FR1 B	_			
	NR_TDD_FR1_C				
	NR_FDD_FR1_D,				
	NR_TDD_FR1_D	1,2,4,5		-104	
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				
M7 Noto2	NR_FDD_FR1_H		dBm/SSB SCS		
$N_{oc}^{$	NR_FDD_FR1_A,		1		
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				
	NR_TDD_FR1_C				
	NR_FDD_FR1_D,	2.6		-101	
	NR_TDD_FR1_D	3,6		-101	
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				
	NR_FDD_FR1_H		ļ		
$\hat{E}_{s}/I_{ot}$		1~6	dB	-3	
$\hat{E}_s/N_{oc}$		1~6	dB	-3	
37 00	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				
SS-RSRP	NR_FDD_FR1_B	1045	dBm/SCS	107	
Note3	NR_TDD_FR1_C	1,2,4,5	ubiii/3C3	-107	
	NR_FDD_FR1_D,				
	NR_TDD_FR1_D				

	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR FDD FR1 G			
—	NR FDD FR1 H			
	NR FDD FR1 A,			
	NR_TDD_FR1_A			
	NR FDD FR1 B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D,	2.0		404
	NR_TDD_FR1_D	3,6		-104
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A		dBm/9.36 MHz	-74.28
<del> </del>	NR_FDD_FR1_B	1,2,4,5		
<u> </u>	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR FDD FR1 E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
lo Note3	NR_FDD_FR1_H			
10 110100	NR_FDD_FR1_A,			
	NR_TDD_FR1_A			
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D,	3,6	dBm/38.16 MHz	-68.18
	NR_TDD_FR1_D	0,0	a2, cc c	33.13
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
<del> </del>	NR_FDD_FR1_G			
Propagation co	NR_FDD_FR1_H	1~6		AWGN
		1~6		1x2
Antenna config	guration CNG shall be used such that hot		llocated and a cons	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.4.7.5.1.2-3: Timing offsets for SFTD accuracy test

Configuration	SFN offset between PCell	Frame boundary offset between PCell and
	and PSCell	PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

### A.4.7.5.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and PSCell. The reported SFTD accuracy shall fulfil the requirement in section 9.1.27 in TS 36.133 [15].

A.4.7.5.2 Void

A.4.7.5.3 Void

A.4.8 Void

# A.5 EN-DC tests with one or more NR cells in FR2

- A.5.1 Void
- A.5.2 Void
- A.5.3 RRC\_CONNECTED state mobility
- A.5.3.1 Void
- A.5.3.2 RRC Connection Mobility Control
- A.5.3.2.1 Void
- A.5.3.2.2 Random Access
- A.5.3.2.2.1 Contention based random access test in FR2 for PSCell/SCell in EN-DC
- A.5.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in section A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.1.1-1. UE capble of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.1.1-2 and Table A.5.3.2.2.1.1-3.

Table A.5.3.2.2.1.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

	Config	Description			
	1	LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex			
'		mode			
	2	LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex			
2		mode			
Note:	The UE is only required to be tested in one of the supported test configurations depending on UE				
	capability				

Table A.5.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC

Paramet	ter	Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in FR2	As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below
Number of SSBs per SS	-burst		2	Different from the definition in A.3.10
SS/PBCH block index			0,1	Different from the definition in A.3.10
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	As defined in A.3.2.1.
PDSCH parameters Note 2	Config 1,2		SR3.1 TDD	As defined in A.3.1.1.
NR RF Channel Number			1	
EPRE ratio of PSS to SS	SS	dB		
EPRE ratio of PBCH_DN	MRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_D	MRS to SSS	dB		
EPRE ratio of PDSCH to	PDSCH_DMRS	dB		

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.5.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC

	Parameter	Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.3.15.2.2.
SSB with index 0	$\hat{E}_s/I_{ot}$	ot dB		SSB with index 0 is signalled to be above
	SSB_RP	dB	[10] dB larger than SSB_RP for SSB index 1	configured rsrp- ThresholdSSB
SSB with	$\hat{E}_s/I_{ot}$	dB -6		SSB with index 1 is signalled to be below
index 1	SSB_RP	dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	configured rsrp- ThresholdSSB
ss-PBCH-Blo	ockPower	dBm/ SCS	TBD	As defined in clause 6.3.2 in TS 38.331 [2].
Configured U $P_{ m CMAX,f,c}$ )	JE transmitted power (	dBm	TBD	As defined in clause 6.2.4 in TS 38.101-2.
PRACH Con	figuration		FR2 PRACH configuration 1	As defined in A.3.8.3.
	Condition oid. oid.	-	AWGN	

### A.5.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.5.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Subclause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.5.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received

Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.5.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2.. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.5.3.2.2.1.2.4 Receiving a an UL grant for msg3 retransmission

To test the UE behavior specified in subclause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

#### A.5.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### A.5.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

#### A.5.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

## A.5.3.2.2.2 Non-contention based random access test in FR2 for PSCell/SCell in EN-DC

### A.5.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in section A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.2.1-1. UE capble of EN-DC withPSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.2.1-2 and Table A.5.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.5.3.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

	Config	onfig Description					
1		LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex					
		mode					
	2	LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex					
2		mode					
Note:	The UE is only required to be tested in one of the supported test configurations depending on UE						
	capability						

Table A.5.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

Parame	eter	Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in	SSB pattern 1	As defined in A.3.10,
			FR2	in FR2	except of Number of
					SSBs per SS-burst
					and SS/PBCH block
					index as below
Number of SSBs per	r SS-burst		2	2	Different from the
					definition in A.3.10
SS/PBCH block inde	ex		0,1	0,1	Different from the
	T = -				definition in A.3.10
CSI-RS	Config 1,2		N/A	CSI-RS.3.1	As defined in A.3.1.4
Configuration				TDD	
Duplex Mode for	Config 1,2		TDD	TDD	
Cell 2	0 " 10		TDD0 (04	TDD0 (04	
TDD Configuration	Config 1,2		TDDConf.3.1	TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH	Config 1,2		SR3.1 TDD	SR3.1 TDD	As defined in A.3.1.1.
parameters Note 2					
NR RF Channel Nun	nber		1	1	
EPRE ratio of PSS to	o SSS	dB			
EPRE ratio of PBCH	_DMRS to SSS	dB			
EPRE ratio of PBCH	l to	dB			
PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to		dB			
SSS			0	0	
EPRE ratio of PDCCH to		dB		O	
PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to		dB			
SSS			_		
EPRE ratio of PDSC PDSCH DMRS	H to	dB			

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.5.3.2.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

Parameter		Unit	Test-1	Test-2	Comments
AoA setup			Setup 2b	Setup 2b	As defined in A.3.15.2.2.
SSB with	$\hat{E}_s/I_{ot}$	dB	4	4	SSB with index 0 is signalled to be above
index 0	SSB_RP	dB	[10] dB larger than SSB_RP for SSB	[10] dB larger than SSB_RP for SSB	configured rsrp- ThresholdSSB
	1		index 1	index 1	000
SSB with	$\hat{E}_{s}/I_{ot}$	dB	-6	-6	SSB with index 1 is signalled to be below
index 1	SSB_RP	dB	Minimum SSB_RP	Minimum SSB_RP	configured rsrp-
III GOX I			value is dependent	value is dependent	ThresholdSSB
			on band and power	on band and power	
			class as specified for	class as specified for	
			spherical coverage	spherical coverage	
			AoA in Table B.2.2-2	AoA in Table B.2.2-2	
ss-PBCH-Blo	ckPower	dBm/ SCS	TBD	TBD	As defined in clause 6.3.2 in TS 38.331 [2].
Configured U	E transmitted	dBm	TBD	TBD	As defined in clause
power ( $P_{\mathrm{CMAX,f,c}}$ )					6.2.4 in TS 38.101-2.
PRACH Configuration		-	FR2 PRACH	FR2 PRACH	As defined in A.3.8.3.
	· ·		configuration 2	configuration 3	
Propagation Condition		-	AWGN	AWGN	
Note 1: vo Note 2: vo	id.				

# A.5.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.5.3.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for SSB-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.5.3.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions

associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

### A.5.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.5.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

## A.5.3.2.3 Void

# A.5.4 Timing

# A.5.4.1 UE transmit timing

## A.5.4.1.1 NR UE Transmit Timing Test for FR2

#### A.5.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 5.4.1.1.1-1.

Table A.5.4.1.1.1-1: Supported test configurations for FR2 PSCell

Configuration	Description					
1	LTE FDD, NR TDD, SSB SCS 240 KHz, data SCS 120 kHz, BW 100 MHz					
2	LTE TDD, NR TDD, SSB SCS 240 KHz, data SCS 120 kHz, BW 100 MHz					

For this test a single NR cell configured as EN-DC PSCell is used. Table A.5.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.5.4.1.1.1-3.

Table A.5.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2	Band Group
SSB ARFCN		1,2	Freq1	Freq1	
Duplex Mode		1,2	T	DD	
TDD configuration		1,2	TDDC	onf.1.2	
BW <sub>channel</sub>	MHz	1,2	100: NR	B,c = 66	
Initial BWP Configuration		1,2	DLBV	/P.0.1	
Illitial BWF Corlingulation		1,2	ULBV	/P.0.1	
Dedicated BWP		1,2	DLBV	/P.1.1	
Configuration			ULBV	/P.1.1	
TRS Configuration		1,2	TRS.2	.1 TDD	
TCI State		1,2	CSI-RS.	Config.0	
DRx Cycle	ms	1,2	N/A	DRX.5 <sup>Note5</sup>	
PDSCH Reference		1,2	SB 2.1 TDD		
measurement channel		1,2	SR.3.1 TDD		
CORESET Reference		1,2	CR.3.1 TDD		
Channel		-	CR.S.1 1DD		
OCNG Patterns		1,2	OCNG p	oattern 1	
PDSCH/PDCCH	kHz	1,2	1.	20	
subcarrier spacing	KI IZ	1,2	12		
EPRE ratio of PSS to					
SSS					
EPRE ratio of PBCH					
DMRS to SSS	dB	1,2	0 0		
EPRE ratio of PBCH to	32	',-			
PBCH DMRS					
EPRE ratio of PDCCH					
DMRS to SSS					

EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH					
DMRS to SSS					
EPRE ratio of PDSCH to					
PDSCH					
EPRE ratio of OCNG					
DMRS to SSS(Note 1)					
EPRE ratio of OCNG to					
OCNG DMRS (Note 1)					
$N_{oc}^{ m Note2}$	dBm/15 kHz	1,2	TBD	TBD	
$N_{oc}^{ m Note2}$	dBm/SCS	1,2	TBD	TBD	
$\hat{E}_s/I_{ot}$		1,2	3	3	
$\hat{E}_s/N_{oc}$		1,2	3	3	
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2	TBD	TBD	
Io <sup>Note3</sup>	dBm/95MHz	1,2	TBD	TBD	
Propagation condition		1,2		'GN	
SRS Config		1,2	Config1 <sup>Note6</sup>	Config2 <sup>Note6</sup>	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: DRx related parameters are given in Table A.3.3.5-1
- Note 6: SRS configs are given in Table A.5.4.1.1.1-3

Table A.5.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

	Field	Config1	Config 2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceldList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-Resourceld	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	sl1	sl1	
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	

periodicityAndOffset-p	sl1,0	sl640,0	Offset to align with DRx
			periodicity
sequenceld	0	0	Any 10 bit number

Table A.5.4.1.1.1-4: Void

## A.5.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.2-1 and setup NR PSCell according to parameters given in Table A.5.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA}) \times T_c \pm T_c$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 13792
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-
- 3) The test system shall adjust the timing of the DL path by values given in Table A.5.4.1.1.2-1

Table A.5.4.1.1.2-1 Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value		
	Test1	Test2	
240	+8*64T <sub>c</sub>	+4*64T <sub>c</sub>	

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Section 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within ( $N_{TA} + N_{TA\_offset}$ ) ×T<sub>c</sub>  $\pm$  T<sub>e</sub> respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX confiured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

# A.5.4.2 UE timer accuracy

# A.5.4.3 Timing advance

## A.5.4.3.1 EN-DC FR2 timing advance adjustment accuracy

#### A.5.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.5.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.5.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.5.4.3.1.2-2, A.5.4.3.1.2-3 and A.5.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in section A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.5.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.5.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot n+k for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Config Description

1 LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2 LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Note: The UE is only required to be tested in one of the supported test configurations

Table A.5.4.3.1.2-1: Timing advance supported test configurations

Table A.5.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		Cell 1: 1	1 for E-UTRAN PCell
		Cell 2: 2	2 for NR PSCell
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command		31	$N_{TA\_new} = N_{TA\_old}$ for the purpose of
(T <sub>A</sub> ) value during T1			establishing a reference value from
			which the timing advance adjustment
			accuracy can be measured during T2
Timing Advance Command		39	$N_{TA\_new} = N_{TA\_old} + 8192 *T_c$ (based on
(T <sub>A</sub> ) value during T2			equation in clause 4.2 of TS 38.213 [3])
T1	S	5	
T2	S	5	

Table A.5.4.3.1.2-3: Cell specific test parameters for timing advance

Parameter	Unit	Test1		
	Oilit	T1	T2	
Duplex mode		TD		
TDD configuration		TDDCo		
BW <sub>channel</sub>	MHz	100: N <sub>RI</sub>	$_{3,c} = 66$	
BWP BW	MHz	100: N <sub>RI</sub>		
DRx Cycle	ms	Not App		
PDSCH Reference measurement channel		SR.3.1		
CORESET Reference Channel		CR.3.1		
TRS configuration		TRS.2.		
TCI configuration		CSI-RS.0	Config.0	
OCNG Patterns		OCNG pa		
SMTC configuration		SMTC.	1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120 k	kHz	
PUCCH/PUSCH subcarrier spacing	kHz	120 ਮ	кНz	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS	dB	0		
EPRE ratio of PDSCH DMRS to SSS	"-	· ·		
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note				
1)				
UE orientation around TBD axis and TBD axis	degrees	ТВ	D	
	dBm/15kH		•	
$N_{oc}^{$	Z	-98	3	
$N_{oc}^{$	dBm/SCS	-89	9	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	3		
$\hat{E}_s/N_{oc}$	dB	3		
Io <sup>Note3</sup>	dBm/ 95.04MHz -57.96			
Propagation condition	-	AWO	<b>GN</b>	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Field Value Comment c-SRS 16 Frequency hopping is disabled 0 b-SRS b-hop 0 freqDomainPosition Frequency domain position of SRS 0 freqDomainShift 0 groupOrSequenceHopping neither No group or sequence hopping SRS-PeriodicityAndOffset sl5=0 Once every 5 slots SSB #0 is used for SRS path loss pathlossReferenceRS ssb-Index=0 estimation usage nonCodebook Non-codebook based UL transmission startPosition resourceMapping setting. SRS on last 0 nrofSymbols symbol of slot, and 1symbols for SRS n1 without repetition. repetitionFactor n1 combOffset-n2 0 transmissionComb setting cyclicShift-n2 0 port1 Number of antenna ports used for SRS nrofSRS-Ports transmission Note: For further information see clause 6.3.2 in TS 38.331 [2].

Table A.5.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

#### A.5.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where k = 24.

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

# A.5.5 Signaling characteristics

# A.5.5.1 Radio link Monitoring

In the following section, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.

# A.5.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.5.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.1.1-1. The test parameters are given in Tables A.5.5.1.1.1-2, A.5.5.1.1.1-3, and A. 5.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with

a reporting periodicity of 5 ms. UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.5.5.1.1.1-1: Supported test configurations for FR2 PSCell

Configuration Description					
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The U	Note: The UE is only required to pass in one of the supported test configurations in FR2				

Table A.5.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

Parameter		Unit	Value	
		0	Test 1	
				10011
Active E-UTRA	Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number				1
Active PSCell				Cell 2
RF Channel Nu	ımber			2
Duplex mode		Config 1, 2		TDD
BW <sub>channel</sub>		Config 1, 2		100: N <sub>RB,c</sub> = 66
DL initial BWP	configuration	Config 1, 2		DLBWP.0.1
DL dedicated B	BWP	Config 1, 2		DLBWP.1.1
configuration		<b>0</b> ,		
UL initial BWP	configuration	Config 1, 2		ULBWP.0.1
UL dedicated B		Config 1, 2		ULBWP.1.1
configuration				
TDD Configura	tion	Config 1, 2		TDDConf.3.1
CORESET Ref		Config 1, 2		CR.3.1 TDD
Channel				
SSB Configura	tion	Config 1, 2		SSB.1 FR2
SMTC Configur		Config 1, 2		SMTC.1
PDSCH/PDCC		Config 1, 2		120 KHz
spacing		3 · · · · · · · · · · · · · · · · · · ·		
PRACH Config	uration	Config 1, 2		Table A.3.8.3.4
SSB index assi		Config 1, 2		0,1
RS	9			5,.
OCNG parame	ters			OP.2
CP length				Normal
	trix and Antenna	Configuration		2x2 Low
	DCI format	. comgaration		1-0
	Number of Co	ntrol OFDM		2
Out of sync	symbols	THE OF DIVI		2
transmission	Aggregation le	evel	CCE	8
parameters		hetical PDCCH RE	dB	4
'	energy to aver		<u></u>	·
	energy	ago 000		
		hetical PDCCH	dB	4
		to average SSS RE		
	energy			
	DMRS precod	er granularity		REG bundle size
	REG bundle s			6
DRX				OFF
Gap pattern ID				gp0
Layer 3 filtering	İ			Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310			1110	1
N311			<u>.</u> 1	
CSI-RS configu	ıration	Config 1, 2		[CSI-RS.3.3 TDD]
TCI states		, <u>g</u> - , <del></del>		[TCI.State.0]
CSI-RS for trac	kina	Config 1, 2		[TRS.2.1 TDD]
T1	······································		S	[1]
T2			S	[10]
T3			S	[12]
D1			S	[9.64]
	onfigurations or	e assigned to the LIF i	L	

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.5.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

Para	Unit		Test 1		
			T1	T2	T3
AoA setup			Setup	3 defined in	A.3.15
EPRE ratio of PDCC	H DMRS to SSS	dB		4	
EPRE ratio of PDCC	H to PDCCH DMRS	dB		0	
EPRE ratio of PBCH	DMRS to SSS	dB			
EPRE ratio of PBCH	to PBCH DMRS	dB			
EPRE ratio of PSS to	SSS	dB			
EPRE ratio of PDSC	H DMRS to SSS	dB		0	
EPRE ratio of PDSC	H to PDSCH DMRS	dB			
EPRE ratio of OCNG	DMRS to SSS	dB			
EPRE ratio of OCNG	to OCNG DMRS	dB			
ssb-Index 0 SNR	Config 1, 2	dB	1	-7	-15
ssb-Index 1 SNR	Config 1, 2		1	-15	-15
$N_{oc}$	dBm/1 5KHz		TBD		
Propagation conditio		TE	DL-A 30ns 75	Hz	
Note 1: OCNG sha	e resource	s in Cell 2 a	re fully alloca	ated and a	

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field		Test 1
	rieiu	Value
gapOffset		0
Note 1:		ame boundary aligned. S is partially overlapped with

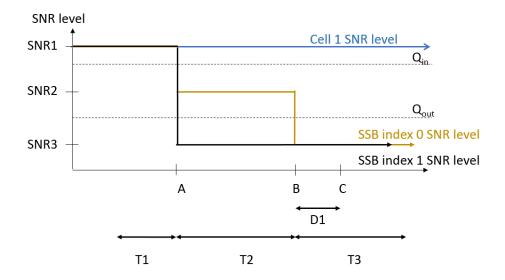


Figure A.5.5.1.1.1-1: SNR variation for out-of-sync testing

## A.5.5.1.1.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.2 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.5.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.2.1-1. The test parameters are given in Tables A.5.5.1.2.1-2, and A.5.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms.

Table A.5.5.1.2.1-1: Supported test configurations for FR2 PSCell

Configuration	onfiguration Description				
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The U	Note: The UE is only required to pass in one of the supported test configurations in FR2				

Table A.5.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

Parameter		Unit	Value	
				Test 1
	Active E-UTRA PCell			Ce1l 1
E-UTRA RF Channel Number				1
Active PSCell RF Channel Nu	ımbor			Cell 2 2
Duplex mode	imper	Config 1, 2		TDD
BW <sub>channel</sub>		Config 1, 2		100: N <sub>RB,c</sub> = 66
DL initial BWP	configuration	Config 1, 2		DLBWP.0.1
DL dedicated E		Config 1, 2		DLBWP.1.1
configuration		3		22
UL initial BWP	configuration	Config 1, 2		ULBWP.0.1
UL dedicated E		Config 1, 2		ULBWP.1.1
configuration				
TDD Configura		Config 1, 2		TDDConf.3.1
CORESET Ref	erence	Config 1, 2		CR.3.1 TDD
Channel		0 " 1 0		000 4 500
SSB Configura		Config 1, 2		SSB.1 FR2
SMTC Configu	ration	Config 1, 2		SMTC.3
PDSCH/PDCC	n subcarrier	Config 1, 2		120 KHz
spacing PRACH Config	uration	Config 1, 2		Table A.3.8.3.4
SSB index assi	aned as PLM	Config 1, 2		0,1
RS Index assi	gried as INLIVI	Corning 1, 2		0,1
OCNG parame	ters			OP.2
CP length				Normal
	trix and Antenna	Configuration		2x2 Low
In sync	DCI format	J		1-0
transmission	Number of Cor	ntrol OFDM symbols		2
parameters	Aggregation le		CCE	4
		netical PDCCH RE	dB	0
		age SSS RE energy		
		netical PDCCH	dB	0
	energy	to average SSS RE		
	DMRS precode	er granularity		REG bundle size
	REG bundle si			6
Out of sync	DCI format	20		1-0
transmission		ntrol OFDM symbols		2
parameters	Aggregation le		CCE	8
	Ratio of hypoth	netical PDCCH RE	dB	4
		age SSS RE energy		
		netical PDCCH	dB	4
	•	to average SSS RE		
	energy	1. 9		DEOL III.
	DMRS precode			REG bundle size
DRX	REG bundle si	<u>ze</u>		6 OFF
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer	1		ms	[6000]
T311 timer			ms	1000
N310			-	1
N311				1
CSI-RS configu	ıration	Config 1, 2		[CSI-RS.3.3 TDD]
TCI states				[TCI.State.0]
CSI-RS for trac	king	Config 1, 2		[TRS.2.1 TDD]

T1		S	[0.5]		
T2		S	[2]		
T3		S	[1.86]		
T4		S	[0.02]		
T5		S	[7]		
D1		S	[6.5]		
Note 1:	All configurations are assigned to the UE prior to the start of time period T1.				
Note 2:	2: UE-specific PDCCH is not transmitted after T1 starts.				
Note 3:	lote 3: E-UTRAN is in non-DRX mode under test.				

Table A.5.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode

Para	Unit	Test 1					
			T1	T2	T3	T4	T5
AoA setup			Setup 3	defined	in A.3.15	1	
EPRE ratio of PDCCH	DMRS to SSS	dB			4		
EPRE ratio of PDCCH	to PDCCH DMRS	dB			0		
EPRE ratio of PBCH D	MRS to SSS	dB					
EPRE ratio of PBCH to	PBCH DMRS	dB					
EPRE ratio of PSS to S	SSS	dB					
EPRE ratio of PDSCH	DMRS to SSS	dB	0				
EPRE ratio of PDSCH	dB	1					
EPRE ratio of OCNG [	EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to	OCNG DMRS	dB					
ssb-Index 0 SNR	Config 1, 2	dB	1	-7	-15	-4.5	1
ssb-Index 1 SNR	Config 1, 2		1	-15	-15	-15	-15
$N_{oc}$	Config 1, 2	dBm/1 5KHz			TBD		
Propagation condition				TDL	-A 30ns	75Hz	
Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.							
	· · · · · · · · · · · · · · · · · · ·						

#### Table A.5.5.1.2.1-4: Void

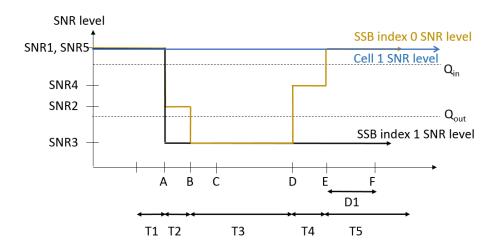


Figure A.5.5.1.2.1-1: SNR variation for in-sync testing

### A.5.5.1.2.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

#### A.5.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.3.1-1. The test parameters are given in Tables A.5.5.1.3.1-2, and A.5.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.1.3.1-1: Supported test configurations for FR2 PSCell

Configuration Description					
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to pass in one of the supported test configurations in FR2					

Table A.5.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

Parameter			Unit	Value
				Test 1
Active E-UTRA	PCell			Cell 1
E-UTRA RF Ch	annel Number			1
Active PSCell				Cell 2
RF Channel Nu	ımber			2
Duplex mode		Config 1, 2		TDD
BW <sub>channel</sub>		Config 1, 2		100: N <sub>RB,c</sub> = 66
DL initial BWP configuration Config 1, 2		Config 1, 2		DLBWP.0.1
		Config 1, 2		DLBWP.1.1
configuration				
UL initial BWP		Config 1, 2		ULBWP.0.1
UL dedicated B	SWP	Config 1, 2		ULBWP.1.1
configuration				
TDD Configura		Config 1, 2		TDDConf.3.1
CORESET Ref	erence	Config 1, 2		CR.3.1 TDD
Channel				
SSB Configuration		Config 1, 2		SSB.1 FR2
SMTC Configur		Config 1, 2		SMTC.1
PDSCH/PDCC	H subcarrier	Config 1, 2		120 KHz
spacing				
PRACH Config		Config 1, 2		Table A.3.8.3.4
SSB index assi	SSB index assigned as RLM Config 1, 2			0,1
OCNG parame	ters			OP.1
CP length				Normal
Correlation Mat	trix and Antenna	Configuration		2x2 Low
Out of sync	DCI format			1-0
transmission	Number of Co	ntrol OFDM symbols		2
parameters	Aggregation le	evel	CCE	8
	Ratio of hypot	hetical PDCCH RE	dB	4
		rage SSS RE energy		
	Ratio of hypot	hetical PDCCH	dB	4
	DMRS energy	to average SSS RE		
	energy			
	DMRS precod			REG bundle size
	REG bundle s	ize		6
DRX Configura	tion			[DRX.3]
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310				1
N311		T =		1
CSI-RS configu	ıration	Config 1, 2		[CSI-RS.3.3 TDD]
TCI states			[TCI.State.0]	
CSI-RS for tracking Config 1, 2			[TRS.2.1 TDD]	
T1		S	[4]	
T2			S	[15]
T3			S	[15]
D1			S	[14.44]
		e assigned to the UE p		art of time period T1.
		is not transmitted afte		
Note 3: E-U	I KAN IS IN NON-	DRX mode under test.		

Table A.5.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

Parame	Parameter			Test 1		
			T1	T2	Т3	
AoA setup		Setup 1 defined in A.3.15				
EPRE ratio of PDCCH D	MRS to SSS	dB		4		
EPRE ratio of PDCCH to	PDCCH DMRS	dB		0		
EPRE ratio of PBCH DM	IRS to SSS	dB				
EPRE ratio of PBCH to F	PBCH DMRS	dB	0			
EPRE ratio of PSS to SS	SS	dB				
EPRE ratio of PDSCH D	MRS to SSS	dB				
EPRE ratio of PDSCH to	PDSCH DMRS	dB				
EPRE ratio of OCNG DMRS to SSS		dB				
EPRE ratio of OCNG to	OCNG DMRS	dB				
ssb-Index 0 SNR	Config 1, 2	dB	1	-7	-15	
ssb-Index 1 SNR	Config 1, 2		1 -15 -15			
$N_{oc}$	Config 1, 2	dBm/15K Hz	TBD			
Propagation condition	•		TDL-A 30ns 75Hz			

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.3.1-4: Void Table A.5.5.1.3.1-5: Void

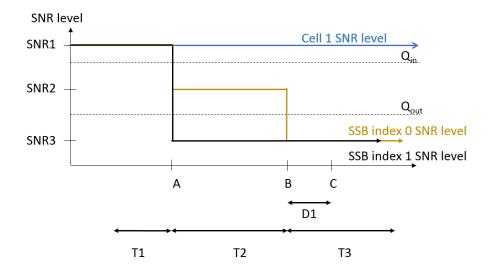


Figure A.5.5.1.3.1-1: SNR variation for out-of-sync testing

### A.5.5.1.3.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.4 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

## A.5.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.4.1-1. The test parameters are given in Tables A.5.5.1.4.1-2, and A.5.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.1.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description				
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to pass in one of the supported test configurations in FR2					

Table A.5.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode

Paramete	er	Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 2		TDD
BW <sub>channel</sub>	Config 1, 2		100: $N_{RB,c} = 66$
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1
TDD Configuration	Config 1, 2		TDDConf.3.1

CORESET Ref	erence	Config 1, 2		CR.3.1 TDD
Channel	0101100	Comig 1, 2		G14.6.1 122
SSB Configura	tion	Config 1, 2		SSB.1 FR2
SMTC Configu		Config 1, 2		SMTC.3
PDSCH/PDCC		Config 1, 2		120 KHz
spacing		3 ,		
PRACH Config	uration	Config 1, 2		Table A.3.8.3.4
SSB index ass		Config 1, 2		0,1
RS	•			·
OCNG parame	ters			OP.1
CP length				Normal
Correlation Ma	trix and Antenna	Configuration		2x2 Low
In sync DCI format			1-0	
transmission	Number of Cor	trol OFDM symbols		2
parameters	Aggregation lev		CCE	4
		etical PDCCH RE	dB	0
	energy to avera	age SSS RE energy		
	Ratio of hypoth		dB	0
		to average SSS RE		
	energy			
	DMRS precode			REG bundle size
	REG bundle size	ze		6
Out of sync	DCI format			1-0
transmission		trol OFDM symbols		2
parameters	Aggregation lev		CCE	8
		etical PDCCH RE	dB	4
		age SSS RE energy		
	Ratio of hypoth		dB	4
		to average SSS RE		
	energy	v ava a davite		DEC hundle sine
	DMRS precode REG bundle size			REG bundle size
DDV Configure		<u>ze</u>		6 (DDV 31
DRX Configura				[DRX.3] N.A.
Gap pattern ID				N.A. Enabled
Layer 3 filtering			ma	
T310 timer			ms	[6000] 1000
N310			ms	1
N310 N311				1 1
			[CSI-RS.3.3 TDD]	
CSI-RS configuration Config 1, 2 TCI states			[CSI-RS.3.3 TDD] [TCI.State.0]	
CSI-RS for tracking Config 1, 2			[TRS.2.1 TDD]	
T1	KIIIY	Coming 1, Z	S	[4]
T2			S	[6]
T3			S	[5,54]
T4			S	[0.02]
T5			S	[7]
D1			S	[6.5]
				10.01

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

E-UTRAN is in non-DRX mode under test. Note 3:

Table A.5.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring test in DRX mode

Parar	Unit			Test 1			
			T1	T2	Т3	T4	T5
AoA setup			Setup 1	defined	in A.3.1	5	
EPRE ratio of PDCCH D	MRS to SSS	dB			4		
EPRE ratio of PDCCH to	o PDCCH DMRS	dB			0		
EPRE ratio of PBCH DN	MRS to SSS	dB					
EPRE ratio of PBCH to	PBCH DMRS	dB					
EPRE ratio of PSS to S	SS	dB					
EPRE ratio of PDSCH D	DMRS to SSS	dB	0				
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DI	MRS to SSS	dB					
EPRE ratio of OCNG to	OCNG DMRS	dB					
ssb-Index 0 SNR	Config 1, 2	dB	1 -7 -15 -4.5 1				1
ssb-Index 1 SNR	Config 1, 2		1 -15 -15 -15 -15				
$N_{oc}$	Config 1, 2	dBm/1 5KHz	TBD				
Propagation condition TDL-A 30ns 75Hz							

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.4.1-4: Void Table A.5.5.1.4.1-5: Void

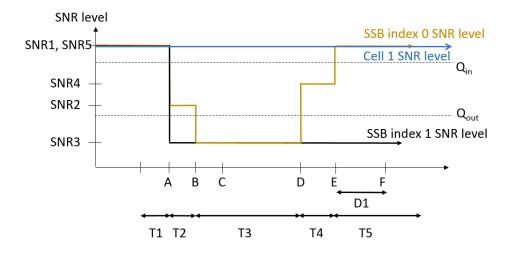


Figure A.5.5.1.4.1-1: SNR variation for in-sync testing.

### A.5.5.1.4.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.5.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.5.1-1, A.5.5.1.5.1-2, A.5.5.1.5.1-3 and A.5.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.5.5.1.5.1-1: Supported test configurations for FR2 PSCell

Co	Configuration Description				
	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note:	Note: The UE is only required to pass in one of the supported test configurations in FR2				

Table A.5.5.1.5.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in non-DRX mode

F	Parameter		Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel N	Number		1
Active PSCell			Cell 2
RF Channel Number			2
Duplex Mode			TDD
TDD Configuration	Config 1		TDDConf.3.1
	Config 2		TDDConf.3.1
RMC CORESET	Config 1		CCR.3.1 TDD
Reference Channel	Config 2		CCR.3.1 TDD
SSB Configuration	Config 1		SSB.1 FR2
	Config 2		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
	Config 2		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	Config 2		120 KHz
csi-RS-Index assigned	as RLM RS		TRS.2.1 TDD

TRS configuration			TRS.2.1 TDD
TCI configuration			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI- RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.3.2 TDD
	Config 2		CSI-RS.3.2 TDD
T1		S	1
T2		S	0.4
T3		S	0.6
D1		S	0.44
	PDCCH is not transmitted after T n non-DRX mode under test.	1 starts.	

Table A.5.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Pa	rameter	Unit	Test 1						
			T1	T2	T3				
PDCCH_	beta	dB	4						
PDCCH_DMRS_beta		dB		4					
PBCH_be	eta	dB							
PSS_beta	а	dB	7						
SSS_beta	а	dB	0				0		
PDSCH_I	beta	dB							
OCNG_b	eta	dB							
SNR	Config 1	dB	[1]	[-7]	[-15]				
SINK	Config 2		[1] [-7] [-		[-15]				
λI	Config 1	dBm/15KHz	TBD						
$N_{oc}$	Config 2		TBD						
Propagati	ion condition		[TDL-A 30ns 75Hz]						

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.5.1-1.

Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.5.5.1.5.1-3A: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode

	Field	Test 1	
	Value		
	0		
gapOffset 0  Note 1: E-UTRAN PCell and PSCell are SFN- synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement			

Table A.5.5.1.5.1-4: Void

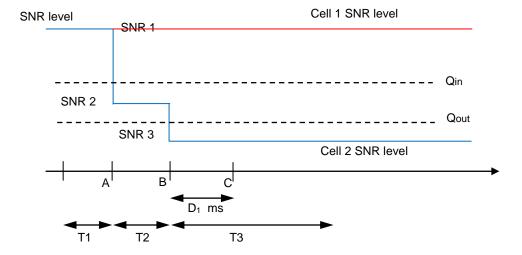


Figure A.5.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.5.5.1.5.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 (E-UTRAN PCell).

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.5.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.6.1-1, A.5.5.1.6.1-2, and A.5.5.1.6.1-3 below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gap.

Table A.5.5.1.6.1-1: Supported test configurations for FR2 PSCell

Con	Configuration Description			
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note:	The UE is only required to pass in one of the supported test configurations in FR2			

Table A.5.5.1.6.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value		
			Test 1		
A ations E LITEA DA	2-11		Call 4		
Active E-UTRA PCell			Cell 1		
E-UTRA RF Channel Number Active PSCell			Cell 2		
			2		
Duplex Mode	RF Channel Number		Z TDD		
TDD	Config 1		TDDConf.3.1		
Configuration		<u> </u>	TDDConf.3.1		
RMC CORESET	Config 2				
Reference	Config 1	_	CCR.3.1 TDD		
Channel	Config 2		CCR.3.1 TDD		
SSB	Config 1		SSB.1 FR2		
Configuration			SSB.1 FR2		
SMTC	Config 2				
	Config 1	_	SMTC.1		
Configuration	Config 2		SMTC.1		
PDSCH/PDCCH	Config 1		120 KHz		
subcarrier	Config 2		120 KHz		
spacing csi-RS-Index assi	anad as DIM DC		TRS.2.1 TDD		
OCNG parameter			OP.1		
			TRS.2.1 TDD		
TRS configuration	<u> </u>		TCI.State.2		
TCI configuration					
CP length Correlation Matrix	and Antonno		Normal		
Configuration Matrix	and Antenna		2x2 Low		
Out of sync	DCI format		1-0		
transmission	Number of Control		2		
parameters	OFDM symbols		_		
	Aggregation level	CCE	8		
	Ratio of hypothetical	dB	4		
	PDCCH RE energy to	42	·		
	average CSI-RS RE				
	energy				
	Ratio of hypothetical	dB	4		
	PDCCH DMRS energy	u.b	'		
	to average CSI-RS RE				
	energy				
	DMRS precoder		REG bundle size		
	granularity		INLO DUITUIO SIZO		
	REG bundle size		6		
In sync	DCI format		1-0		
transmission	Number of Control		2		
parameters	OFDM symbols		۷		
Paramotors	Aggregation level	CCE	4		
	Aggregation level	COL	7		

	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX	DRX		OFF	
Gap pattern ID	Gap pattern ID		N.A.	
Layer 3 filtering			Enabled	
T310 timer	T310 timer		0	
T311 timer		ms	1000	
N310			1	
N311			1	
CSI-RS	Config 1		CSI-RS.3.2 TDD	
configuration	configuration Config 2		CSI-RS.3.2 TDD	
T1		S	1	
T2		S	0.4	
T3		S	[0.6]	
D1		S	[0.24]	
Note 1: UE-spe	ecific PDCCH is not transmi	tted after T1 sta	rts.	

Table A.5.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1					
			T1	T2	T3	T4	T5	
PDCCH_beta		dB	4					
PDCCH_DMRS_beta		dB	4					
PBCH_beta		dB						
PSS_beta		dB						
SSS_beta		dB	0					
PDSCH_beta		dB						
OCNG_beta		dB						
SNR	Config 1, 2	dB	[1]	[-7]	[-15]	[-4.5]	[1]	
$N_{oc}$	Config 1, 2	dBm/15KHz	TBD					
Propagation condition			[TDL-A 30ns 75Hz]					

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 2: E-UTRAN is in non-DRX mode under test.

- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.5.5.1.6.1-3A: Void

Table A.5.5.1.6.1-4: Void

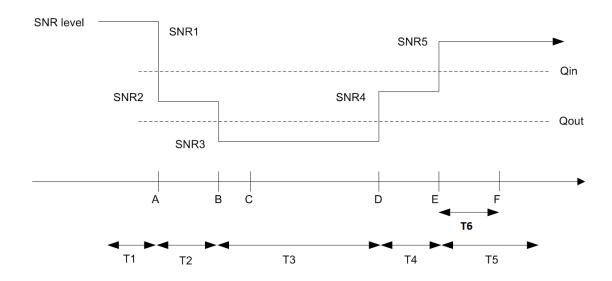


Figure A.5.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.5.5.1.6.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

#### A.5.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.7.1-1, A.5.5.1.7.1-2, and A.5.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements without gap.

Table A.5.5.1.7.1-1: Supported test configurations for FR2 PSCell

Configuration	Description				
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2 LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mod					
Note: The UE is only	required to pass in one of the supported test configurations in FR2				

Table A.5.5.1.7.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
	Active E-UTRA PCell		Cell 1
E-UTRA RF Cha	annel Number		1
Active PSCell			Cell 2
RF Channel Nur	nber		2
Duplex Mode	I 0 . f 1		TDD
TDD	Config 1		TDDConf.3.1
Configuration	Config 2		TDDConf.3.1
RMC	Config 1		CCR. 3.1 TDD
CORESET	Config 2		CCR. 3.1 TDD
Reference Channel			
SSB	Config 1		SSB.1 FR2
Configuration	Config 2	1	SSB.1 FR2
SMTC	Config 1		SMTC.1
Configuration	Config 2	-	SMTC.1
PDSCH/PDCC	Config 1		120 KHz
H subcarrier			
spacing	Config 2		120 KHz
csi-RS-Index as	signed as RLM RS		TRS.2.1 TDD
TRS configuration			TRS.2.1 TDD
TCI configuration			TCI.State.2
OCNG paramete	ers		OP.1
CP length			Normal
Correlation Matr Configuration	ix and Antenna		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	4
	DMRS precoder granularity		REG bundle size
REG bundle size			6
DRX	1 12 12 11 11 10 01 12 0		DRX.7
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
,			

T310 timer	ms	0		
T311 timer	ms	1000		
N310		1		
N311		1		
CSI-RS Config 1		CSI-RS.3.2 TDD		
configuration Config 2		CSI-RS.3.2 TDD		
T1	S	1		
T2	S	0.4		
T3	S	[0.6]		
D1	s [0.24]			
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Note 2: E-UTRAN is in non-DRX mode under test.

Table A.5.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
PDCCH_be	eta	dB	4		
PDCCH_DI	MRS_beta	dB	4		
PBCH_beta	l	dB			
PSS_beta		dB			
SSS_beta		dB	0		
PDSCH_be	ta	dB			
OCNG_beta	a	dB			
SNR	Config 1	dB	[1]	[-7]	[-15]
SINK	Config 2		[1]	[-7]	[-15]
λ/	Config 1	dBm/15KHz	TBD		
$N_{oc}$	Config 2			TBD	
Propagation	n condition		[TDL-A 30ns 75Hz]		

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Measurement gap configuration is assigned to the UE prior to the start of time period T1. Note 4:
- The timers and layer 3 filtering related parameters are configured prior to the start of time Note 5: period T1.
- The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 6:
- SNR levels correspond to the signal to noise ratio over the SSS REs. Note 7:
- The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively Note 8: in figure A.5.5.1.7.1-1.

Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.5.5.1.7.1-3A: Void

Table A.5.5.1.7.1-4: Void

Table A.5.5.1.7.1-5: Void

Table A.5.5.1.7.1-6: Void

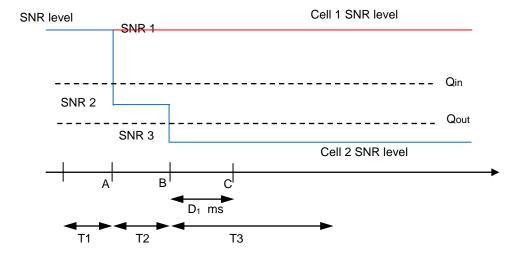


Figure A.5.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.5.5.1.7.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 (E-UTRAN PCell).

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

#### A.5.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.8.1-1, A.5.5.1.8.1-2, A.5.5.1.8.1-3 and A.5.5.1.8.1-3A below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.5.5.1.8.1-1: Supported test configurations for FR2 PSCell

Configuration	Description				
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only r	equired to pass in one of the supported test configurations in FR2				

Table A.5.5.1.8.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTR	A PCell		Cell 1
	E-UTRA RF Channel Number		1
Active PSCell			Cell 2
RF Channel N	umber		2
Duplex Mode			TDD
TDD	Config 1		TDDConf.3.1
Configuratio n	Config 2		TDDConf.3.1
RMCCORES	Config 1		CCR.3.1 TDD
ET Reference Channel	Config 2		CCR.3.1 TDD
SSB	Config 1		SSB.1 FR2
Configuratio	Config 2		SSB.1 FR2
n	Corning 2		30B.11 K2
SMTC	Config 1		SMTC.1
Configuratio n	Config 2		SMTC.1
PDSCH/PD	Config 1		120 KHz
CCH subcarrier	Config 2		120 KHz
spacing			
	assigned as RLM RS		TRS.2.1 TDD
TRS configura	tion		TRS.2.1 TDD
TCI configurat			TCI.State.2
OCNG parame	eters		OP.1
CP length			Normal
Correlation Ma Configuration	atrix and Antenna		2x2 Low
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
· •	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
	DCI format		1-0

In sync transmission	Number of Control OFDM symbols		2	
parameters	Aggregation level	CCE	4	
parameters	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	
Gap pattern ID	)		gp0	
Layer 3 filtering	g		Enabled	
T310 timer		ms	0	
T311 timer		ms	1000	
N310			1	
N311			1	
CSI-RS	Config 1		CSI-RS.3.2 TDD	
configuration	configuration Config 2		CSI-RS.3.2 TDD	
T1	T1		1	
	T2		0.4	
T3		S	[0.6]	
D1		S	[0.44]	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test.				

Table A.5.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
PDCCH_be	eta	dB			4		
PDCCH_D	MRS_beta	dB			4		
PBCH_beta	а	dB					
PSS_beta		dB					
SSS_beta		dB	0				
PDSCH_be	eta	dB					
OCNG_bet	а	dB					
SNR	Config 1, 2	dB	[1]	[-7]	[-15]	[-4.5]	[1]
$N_{oc}$	Config 1, 2	dBm/15KHz	TBD				
Propagatio	n condition		[TDL-A 30ns 75Hz]				

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.5.5.1.8.1-3A: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in DRX mode

Field		Test 1	
	Field		
	gapOffset	0	
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned. (Ensure that RLM partially overlapped with m gap)	undary RS is	

Table A.5.5.1.8.1-4: Void

Table A.5.5.1.8.1-5: Void

Table A.5.5.1.8.1-6: Void

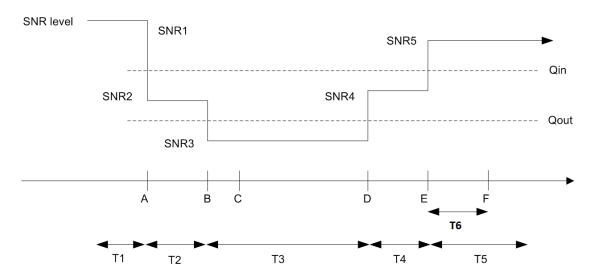


Figure A.5.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

### A.5.5.1.8.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.1.9 EN-DC Radio Link Monitoring UE Scheduling Restrictions on FR2

### A.5.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly, under the condition that the SSB is with different numerology as the PDCCH/PDSCH.

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and NR FR2 PSCell (Cell 2). The test parameters for NR PSCell are given in table A.5.5.1.9.1-1, table A.5.5.1.9.1-2 and table A.5.5.1.9.1-3 below and the parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

Table A.5.5.1.9.1-1: Supported test configurations

Configuration	Description				
1	FDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode				
2	TDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only re	equired to be tested in one of the supported test configurations.				

Table A.5.5.1.9.1-2: General test parameters for RLM scheduling restriction test case in FR2

Parameter	Unit	Test	Value	Comment
		configuration		
RF Channel Number		1, 2	1 and 2	1 for NR PSCell and 2 for LTE PCell
SSB configuration		1, 2	SSB.1 FR2	
SMTC configuration		1, 2	SMTC	
			pattern 1	
DRX cycle length	S	1, 2	OFF	
T1	S	1, 2	5	During T1 the UE is required to correctly transmit ACK/NACK

Table A.5.5.1.9.1-3: Cell specific test parameters for RLM scheduling restriction test case in FR2

Parameter	Unit	Test	Cell 2		
		configuration	AoA1	AoA2	
TDD configuration		1, 2 1, 2	TDDConf.3.1		
PDSCH RMC		1, 2	SR.3.1 TDD	Not sent	
configuration					
RMSI CORESET		1, 2	CR.3.1	Not sent	
RMC configuration					
Dedicated CORESET		1, 2	CCR.3.2	Not sent	
RMC configuration					
TRS configuration		1, 2 1, 2	TRS.2.1 TDD	[TRS.2.2 TDD]	
PDCCH/PDSCH TCI		1, 2	TCI.State.2	Not sent	
state					
OCNG Pattern		1, 2	OP.1 defined in	Not sent	
			A.3.2.1		
Initial DL BWP		1, 2	DLBWP.0.1		
configuration					
Initial UL BWP		1, 2	ULBV	/P.0.1	
configuration		4.0	TDO 0 4 TDD	ITDO O O TDDI	
RLM-RS		1, 2	TRS.2.1 TDD	[TRS.2.2 TDD]	
AoA setup		1, 2		ed in A.3.15.3	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1, 2	3	N/A	
$N_{oc}$ Note2	dBm/SCS	1, 2	-84.9	Not sent	
$\hat{E}_s/N_{oc}$	dB	1, 2	3	N/A	
SS-RSRP Note3	dBm/SCS	1, 2	-81.9	-81.9	
lo	dBm/95.04 MHz	1, 2 1, 2	-51.15	-52.91	
Propagation		1, 2	AWGN		
Condition					

# A.5.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

# A.5.5.2 Interruption

# A.5.5.2.1 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

### A.5.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in section 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.1.1-1.

The general test parameters are given in Table A.5.5.2.1.1-2, and NR cell specific test parameters are given in Table A.5.5.2.1.1-3 and A.5.5.2.1.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.1.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell on and Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE

PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the whole time duration to ensure UE would not enter DRX state on PSCell.

Table A.5.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.5.2.1.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.4	DRX related parameters are defined in
		DRA.4	Table A.3.3.4-1
Measurement gap pattern		OFF	
Id		OFF	
T1	S	10	

Table A.5.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parame	ter	Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
BWchannel	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66
Downlink initial BWP			· ·
Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated	Config 1,2		DLBWP.1.1
BWP Configuration	Corning 1,2		DEBWF.I.I
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
PDSCH Reference	Config 1,2		SR.3.1 TDD
measurement channel	Corning 1,2		3K.3.1 1DD
RMSI CORESET	Config 1,2		CR.3.1 TDD
parameters	Corning 1,2		CIX.3.1 100
PDCCH CORESET	Config 1,2		CCR.3.1 TDD
parameters	Coming 1,2		
OCNG Patterns			OP.1
SSB Configuration	-		SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1
EPRE ratio of PSS to SSS		dB	
EPRE ratio of PBCH DMRS			
EPRE ratio of PBCH to PBC			
EPRE ratio of PDCCH DMR			•
EPRE ratio of PDCCH to PDCCH DMRS			0
EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Propagation Condition			AWGN
Propagation Condition Time offset to cell1 Note 2		μS	
Time onset to cell 1 loss 2			3

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.1.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
Angle of arrival configuration			Setup 1 defined in section A.3.15.1
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
$N_{oc}$ Note1	NR_TDD_FR2_F	dBm/15kHz	1.04.01
00	NR_TDD_FR2_G	UDIII/ IOKHZ	[-84.9]
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
	NR_TDD_FR2_A	dBm/SCS	
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_B	Note3	[-84.9]
	NR_TDD_FR2_F		

		NR_TDD_FR2_G NR_TDD_FR2_T		
		NR_TDD_FR2_Y		
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$			dB	0
		NR_TDD_FR2_A		
		NR_TDD_FR2_B		
Io <sup>Note2</sup>		NR_TDD_FR2_F	dBm/95.04	[-52.9]
10		NR_TDD_FR2_G	MHz Note4	[-02.9]
		NR_TDD_FR2_T		
		NR_TDD_FR2_Y		
Note 1: Interference from other cells and rassumed to be constant over sub-				
	AWGN of appropriate power for $N_{oc}$ to be fulfilled.			d.
Note 2:	SS-RSRP and lo levels have been derived from other parameters for			ther parameters for
	information purposes. They are not settable parameters themselves.			
Note 3:				
	interference and noise at each receiver antenna port.			
Note 4:	Equivalent quiet zone	power received by an	antenna with 0d	Bi gain at the centre of the

Table A.5.5.2.1.1-5: Void

## A.5.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in section 8. 2.1.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.2.2 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

#### A.5.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in section 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.2.1-1.

The general test parameters are given in Table A.5.5.2.2.1-2, and NR cell specific test parameters are given in Table A.5.5.2.2.1-3 and A.5.5.2.2.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.2.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the whole time duration to ensure UE would not enter DRX state on PSCell.

Table A.5.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.5.2.2.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.6	DRX related parameters are defined in
		DIXX.0	Table A.3.3.6-1
Measurement gap pattern		OFF	
Id		OFF	
T1	s	10	

Table A.5.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Frequency Range	Parame	ter	Unit	Cell 2
Duplex mode	Frequency Range			FR2
TDD configuration		Config 1,2		TDD
BW_channel				TDDConf.3.1
Downlink initial BWP	<u> </u>		MHz	100: Nrb.c = 66
Domilink dedicated   BWP Configuration   Config 1,2   DLBWP.1.1	Downlink initial BWP	1 .		DI DIVID O 4
Description   Description	Configuration	Config 1,2		DLBWP.0.1
Description   Config 1,2	Downlink dedicated	Config 1 2		DI RWD 1 1
configuration         Config 1,2         ULBWP.0.1           Uplink dedicated BWP configuration         Config 1,2         ULBWP.1.1           TRS configuration         Config 1,2         TRS.2.1 TDD           TCI state         Config 1,2         TCI.State.0           PDSCH Reference measurement channel         Config 1,2         SR.3.1 TDD           RMSI CORESET config 1,2         CR.3.1 TDD           parameters         Config 1,2         CCR.3.1 TDD           PDCCH CORESET parameters         OP.1         SSB.1 FR2           SMTC Configuration         SSB.1 FR2         SMTC.1           SMTC Configuration         SSB.1 FR2         SMTC.1           EPRE ratio of PSS to SSS         BPRE ratio of PBCH DMRS to SSS         BPRE ratio of PBCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         BPRE ratio of PDCCH DMRS to SSS         BPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDSCH DMRS to SSS         BPRE ratio of PDSCH DMRS to SSS         O           EPRE ratio of PDSCH DMRS to SSS         BPRE ratio of PDSCH DMRS to SSS         O           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)         T           EPRE ratio of OCNG DMRS to SSS(Note 1)         T         T           EPRE ratio of OCNG DMRS to SSS(Note 1)         T         T	BWP Configuration	Cornig 1,2		DLBWP.1.1
Uplink dedicated BWP configuration		Config 1,2		ULBWP.0.1
configuration         Config 1,2         ULBWP.1.1           TRS configuration         Config 1,2         TRS.2.1 TDD           TCI state         Config 1,2         TCI.State.0           PDSCH Reference measurement channel         Config 1,2         SR.3.1 TDD           RMSI CORESET parameters         Config 1,2         CCR.3.1 TDD           PDCCH CORESET parameters         Config 1,2         CCR.3.1 TDD           OCNG Patterns         OP.1         SSB.1 FR2           SMTC Configuration         SSB.1 FR2         SMTC.1           SMTC Configuration         Config 1,2         SMTC.1           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH to PBCH DMRS         EPRE ratio of PBCH to PBCH DMRS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH to PDCCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)           Epre ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)         EPRE ratio of OCNG DMRS (Note 1)           Epre ratio of OCNG DMRS (Note 1)         EPRE ratio of OCNG DMRS (Note 1)         EPRE ratio OCNG DMRS (Note 1)				
TCI state		Config 1,2		ULBWP.1.1
PDSCH Reference	TRS configuration	Config 1,2		TRS.2.1 TDD
measurement channel         Config 1,2         SR.3.1 TDD           RMSI CORESET parameters         Config 1,2         CR.3.1 TDD           PDCCH CORESET parameters         Config 1,2         CCR.3.1 TDD           OCNG Patterns         OP.1         SSB Configuration         SSB.1 FR2           SMTC Configuration         Config 1,2         SMTC.1           EPRE ratio of PSS to SSS         dB         EPRE ratio of PSCH DMRS to SSS           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH to PDCCH DMRS           EPRE ratio of PDSCH to PDCCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH         O           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG DMRS (Note 1)         EPRE ratio of OCNG DMRS (Note 1)           EPRE ratio of OCNG DMRS to OCNG DMRS (Note 1)         EPRE ratio of OCNG DMRS (Note 1)         EPRE ratio of OCNG DMRS (Note 1)		Config 1,2		TCI.State.0
RMSI CORESET   Config 1,2   CR.3.1 TDD	PDSCH Reference	Config 1.2		SP 3.1 TDD
Darameters   Config 1,2   CR.3.1 TDD	measurement channel	Cornig 1,2		317.3.1 100
PDCCH CORESET parameters  OCNG Patterns  SSB Configuration  SSB Configuration  SSB.1 FR2  SMTC Configuration  EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDSCH to PDCCH DMRS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS  ABOUT 17  Propagation Condition  AWGN	RMSI CORESET	Config 1.2		CR 3.1 TDD
Decided Repairs   Configuration   Configuration   SSB Configuration   SSB.1 FR2	•	Corning 1,2		GIX.3.1 1DD
OCNG Patterns  SSB Configuration  SSB.1 FR2  SMTC Configuration  Config 1,2  EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH DMRS EPRE ratio of PDCH DMRS to SSS  EPRE ratio of PDCH DMRS to SSS  EPRE ratio of PDCH to PDCH DMRS EPRE ratio of PDCH to PDCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of OCNG DMRS to SSS  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG DMRS (Note 1)  EPRE ratio of OCNG DMRS (Note 1)  AWGN		Config 1.2		CCR 3.1 TDD
SSB Configuration   SSB.1 FR2		Coming 1,2		
SMTC Configuration         Config 1,2         SMTC.1           EPRE ratio of PSS to SSS         dB           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH to PBCH DMRS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH to PDCCH DMRS           EPRE ratio of PDSCH DMRS to SSS         0           EPRE ratio of PDSCH to PDSCH         EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         AWGN				
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG DMRS (Note 1)  EPRE ratio of OCNG DMRS (Note 1)  EPRE ratio of OCNG DMRS (Note 1)  AWGN				
EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PBCH to PBCH DMRS           EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH DMRS           EPRE ratio of PDSCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           AWGN		Config 1,2		SMTC.1
EPRE ratio of PBCH to PBCH DMRS           EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH DMRS         0           EPRE ratio of PDSCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           AWGN			dB	
EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH DMRS         0           EPRE ratio of PDSCH DMRS to SSS         0           EPRE ratio of PDSCH to PDSCH         EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         EPRE ratio of OCNG to OCNG DMRS (Note 1)           Ey/Noc         dB         17           Propagation Condition         AWGN				
EPRE ratio of PDCCH to PDCCH DMRS         0           EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)         EPRE ratio of OCNG to OCNG DMRS (Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)         dB         17           Propagation Condition         AWGN				
EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  És/Noc dB 17  Propagation Condition AWGN				2
EPRE ratio of PDSCH to PDSCH           EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           Ês/Noc         dB           17           Propagation Condition         AWGN				0
EPRE ratio of OCNG DMRS to SSS(Note 1)           EPRE ratio of OCNG to OCNG DMRS (Note 1)           Ês/Noc         dB           17           Propagation Condition         AWGN				
EPRE ratio of OCNG to OCNG DMRS (Note 1)         dB         17           Propagation Condition         AWGN				
Ê <sub>s</sub> /N <sub>oc</sub> dB 17  Propagation Condition AWGN	FPRF ratio of OCNG to OCNG DMRS (Note 1)			
Propagation Condition AWGN			dB	17
Propagation Condition AWGN Time offset to cell1 Note 2 ms 3	<u> </u>			1.7
Time offset to cell1 Note 2 ms 3	Propagation Condition			AWGN
	Time offset to cell1 Note 2		ms	3

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.2.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Para	meter	Unit	Cell 2
Angle of arrival configuration			Setup 1 defined in section A.3.15.1
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
$N_{oc}$ Note1	NR_TDD_FR2_F	dBm/15kHz	[ 0 4 0]
	NR_TDD_FR2_G	UDIII/ IOKIIZ	[-84.9]
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
	NR_TDD_FR2_A	dDm/CCC	
SS-RSRPNote2	NR_TDD_FR2_B	dBm/SCS Note3	[-84.9]
	NR_TDD_FR2_F	- 10-0	

		NR_TDD_FR2_G		
	_	NR_TDD_FR2_T NR_TDD_FR2_Y		
$\hat{E}_{s}/I_{ot}$	·		dB	TBD
		NR_TDD_FR2_A		
		NR_TDD_FR2_B		
Io <sup>Note2</sup>		NR_TDD_FR2_F	dBm/95.04	[-52.9]
10		NR_TDD_FR2_G	MHz Note4	[-02.8]
		NR_TDD_FR2_T		
		NR_TDD_FR2_Y		
Note 1: Interference from other cells and r assumed to be constant over subc				
	AWGN of appropriate power for $N_{oc}$ to be fulfilled.			d.
Note 2:	SS-RSRP and lo levels have been derived from other parameters for			
	information purposes. They are not settable parameters themselves.			
Note 3:				
	interference and noise at each receiver antenna port.			
Note 4:	Equivalent p quiet zone	power received by an	antenna with 0d	Bi gain at the centre of the

Table A.5.5.2.2.1-5: Void

## A.5.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in section 8. 2.1.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.2.3 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

#### A.5.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in section 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.3.1-1.

The general test parameters are given in Table A.5.5.2.3.1-2, and NR cell specific test parameters are given in Table A.5.5.2.3.1-3 and A.5.5.2.3.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 is NR FR2 PSCell and NR FR2 deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.3.1-1: Interruption during measurements on deactivated NR SCC supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.5.2.3.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		-, -	other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.5.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parame	ter	Unit	Cell 2	Cell 3
Frequency Range			FR2	FR2
Duplex mode	Config 1		FDD	FDD
	Config 2		TDD	TDD
TDD configuration	Config 1		N.A	N.A
_	Config 2		TBD	TBD
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
Initial BWP	Config 1.2		TBD	TBD
Configuration	Config 1,2		IBD	עסו
PDSCH Reference	Config 1.2		CD 2.4 TDD	
measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET	Config 1.2		CR.3.1 TDD	CR.3.1 TDD
parameters	Config 1,2		CR.3.1 IDD	CR.3.1 100
PDCCH CORESET	Config 1.2		TBD	TBD
parameters	Config 1,2		IBD	עסו
OCNG Patterns			OP.1	OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2	SMTC.1 FR2
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBC				
EPRE ratio of PDCCH DMR			_	_
EPRE ratio of PDCCH to PI		dB	0	0
	EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1)		-		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		1		
Ês/Noc		dB	TBD	TBD
Propagation Condition		QD	AWGN	AWGN
Time offset to cell1 Note 2		μS	3	3
Time offset to cell1 Note 3			-	3
		μS th cells are full	y allocated and a constant to	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells
- Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells

Table A.5.5.2.3.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

F	Parameter	Unit	Cell 2	Cell 3
UE orientation aro	und TBD axis and TBD		т	3D
axis			11	30
Relative difference	e in angle of arrival of cell 2	degrees	Т	3D
and cell 3 relative	to cell 1	uegrees	11	36
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
Note1	NR_TDD_FR2_C		TBD	
$N_{oc}^{ m Note1}$	NR_TDD_FR2_D	dBm/15kHz <sup>Note4</sup>		TBD
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_A			
λ7 Note1	NR_TDD_FR2_B			
$N_{oc}^{ m Note1}$	NR_TDD_FR2_C	dBm/SCSNote3	TBD	TBD
	NR_TDD_FR2_D	1		
	NR_TDD_FR2_E			

	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
SS-RSRPNote2	NR_TDD_FR2_D	dBm/SCS Note4	TBD	TBD
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD
Io <sup>Note2</sup>	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD	TBD

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the center of the guiet zone
- Note 5: As observed with 0 dBi gain antenna at the center of the guiet zone

### A.5.5.2.3.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.3.2-1 and Table A.5.5.2.3.2-2.

Table A.5.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4

Table A.5.5.2.3.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	8 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.2.4 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

### A.5.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in section 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.4.1-1.

The general test parameters are given in Table A.5.5.2.4.1-2, and NR cell specific test parameters are given in Table A.5.5.2.4.1-3 and A.5.5.2.4.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 is NR FR2 PSCell and NR FR2 deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.4.1-1: Interruption during measurements on deactivated NR SCC supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
AoA number		1	Applicable to cell2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
ld		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.5.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parame	ter	Unit	Cell 2	Cell 3
Frequency Range			FR2	FR2
Duplex mode	Config 1		FDD	FDD
	Config 2		TDD	TDD
TDD configuration	Config 1		N.A	N.A
_	Config 2		TBD	TBD
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
Initial BWP	Config 1.0		TBD	TBD
Configuration	Config 1,2		IBD	עסו
PDSCH Reference	Config 1.2		CD 2.4 TDD	
measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
parameters	Corning 1,2		CK.3.1 1DD	CK.3.1 100
PDCCH CORESET	Config 1,2		TBD	TBD
parameters	Corning 1,2		IBD	100
OCNG Patterns			OP.1	OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2	SMTC.1 FR2
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS				
EPRE ratio of PBCH to PB0				
EPRE ratio of PDCCH DMF				
EPRE ratio of PDCCH to P		dB	0	0
	EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)		-		
Ê <sub>s</sub> /N <sub>oc</sub>	Dimito (moto 1)	dB	TBD	TBD
Propagation Condition		32	AWGN	AWGN
Time offset to cell1 Note 2		ms	3	3
Time offset to cell1 Note 3		นร	•	3
		· · · · · · · · · · · · · · · · · · ·	v allocated and a constant to	•

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table A.5.5.2.4.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Pa	rameter	Unit	Cell 2	Cell 3
UE orientation arou	nd TBD axis and TBD		т	3D
axis			11	3D
Relative difference i	n angle of arrival of cell 2	degrees	Т	3D
and cell 3 relative to	cell 1	degrees	11	J. J. J. J. J. J. J. J. J. J. J. J. J. J
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
<b>∖</b> / Note1	NR_TDD_FR2_C		TBD	TBD
$N_{oc}^{ m Note1}$	NR_TDD_FR2_D	dBm/15kHz <sup>Note4</sup>		
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_A			
Note1	NR_TDD_FR2_B			
$N_{oc}^{ m Note1}$	NR_TDD_FR2_C	dBm/SCS <sup>Note3</sup>	TBD	TBD
	NR_TDD_FR2_D			
	NR_TDD_FR2_E			

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells

	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
	NR_TDD_FR2_C			
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_D	dBm/SCS Note4	TBD	TBD
	NR_TDD_FR2_E			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD
Io <sup>Note2</sup>	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD	TBD

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the guiet zone
- Note 5: As observed with 0dBi gain antenna at the center of the guiet zone

### A.5.5.2.4.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.4.2-1 and Table A.5.5.2.4.2-2.

Table A.5.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4

Table A.5.5.2.4.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	8 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.2.5 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

### A.5.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in section 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.5.1-1.

The general test parameters are given in Table A.5.5.2.5.1-2, and NR cell specific test parameters are given in Table A.5.5.2.5.1-3 and A.5.5.2.5.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 and Cell3 is LTE PCell and LTE deactivated SCell, Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.5.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.5.2.5.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and two is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on E-UTRAN RF channel number 1.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.5.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E UTRAN SCC in synchronous EN-DC

Paramet	er	Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
BWchannel	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS	to SSS	dB	
EPRE ratio of PBCH to PBC	H DMRS		
EPRE ratio of PDCCH DMR			
EPRE ratio of PDCCH to PD			0
EPRE ratio of PDSCH DMR			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Ê <sub>s</sub> /N <sub>oc</sub>		dB	TBD
Propagation Condition			AWGN
Time offset to cell1 Note 2		μS	3

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.5.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

Para	ameter	Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
λ/ Note1	NR_TDD_FR2_C		
$N_{oc}^{}$ Note1	NR_TDD_FR2_D	dBm/15kHz <sup>Note4</sup>	TBD
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_A		TBD
	NR_TDD_FR2_B	]	
λ/ Note1	NR_TDD_FR2_C		
$N_{oc}^{}$ Note1	NR_TDD_FR2_D	dBm/SCS <sup>Note3</sup>	
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_C	dBm/SCS Note4	TBD
	NR_TDD_FR2_D		
	NR_TDD_FR2_E	1	

	NR_TDD_FR2_F NR_TDD_FR2_G			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	
Io <sup>Note2</sup>	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD	
Note 1:	Interference from other cells and noise sources not spe	cified in the test is assum	ed to be constant over	
	subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.			
Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone				
Note 5:	Note 5: As observed with 0dBi gain antenna at the center of the quiet zone			

### A.5.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.5.2-1 and Table A.5.5.2.5.2-2.

Table A.5.5.2.5.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	5

Table A.5.5.2.5.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.2.6 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

# A.5.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in section 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.6.1-1.

The general test parameters are given in Table A.5.5.2.6.1-2, and NR cell specific test parameters are given in Table A.5.5.2.6.1-3 and A.5.5.2.6.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 and Cell3 is LTE PCell and LTE deactivated SCell, Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.6.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.5.2.6.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1.2	One is E-UTRAN RF channel and two is E-
		1, 2	UTRAN RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on E-UTRAN RF
SCell			channel number 1.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
ld		Oli	
SCell measurement cycle	ms	640	
(measCycleSCell)	1113	040	
T1	S	10	

Table A.5.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E UTRAN SCC in asynchronous EN-DC

Paramet	er	Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	
EPRE ratio of PBCH DMRS	to SSS		
EPRE ratio of PBCH to PBC			
EPRE ratio of PDCCH DMR			
EPRE ratio of PDCCH to PD			0
EPRE ratio of PDSCH DMR			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)		ID.	TDD
Ê <sub>s</sub> /N <sub>oc</sub>		dB	TBD
Propagation Condition			AWGN
Time offset to cell1 Note 2	1 1 1 1 1	ms	3

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.6.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC

Para	ameter	Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
9	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
λ/ Note1	NR_TDD_FR2_C		
$N_{oc}^{}$ Note1	NR_TDD_FR2_D	dBm/15kHz <sup>Note4</sup>	TBD
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_A		TBD
	NR_TDD_FR2_B		
$N_{oc}$ Note1	NR_TDD_FR2_C		
TV <sub>oc</sub>	NR_TDD_FR2_D	dBm/SCS <sup>Note3</sup>	
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_C	dBm/SCS Note4	TBD
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		

	NR_TDD_FR2_F NR_TDD_FR2_G			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	
Io <sup>Note2</sup>	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD	
Note 1:	Interference from other cells and noise sources not spe	cified in the test is assum	ed to be constant over	
	subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.			
Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Note 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone				
Note 5:	Note 5: As observed with 0dBi gain antenna at the center of the quiet zone			

### A.5.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.6.2-1 and Table A.5.5.2.6.2-2.

Table A.5.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	5

Table A.5.5.2.6.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.3 SCell Activation and Deactivation Delay

## A.5.5.3.1 SCell Activation and deactivation of SCell in FR2 intra-band in non-DRX

#### A.5.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in section A.4.5.3.1.1 except the SCell is in FR2 intra-band.

The supported test configurations are shown in table A.5.5.3.1.1-1 below. The general and cell specific test parameters are the same except those described in the following section. The listed parameter values in Tables A.5.5.3.1.1-2 and A.5.5.3.1.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2 and A.4.5.3.1.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.1.1-4 below.

Table A.5.5.3.1.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell

Configuration Description			
1	FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2	TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note: The UE i	s only required to pass in one of the supported test configurations		

Table A.5.5.3.1.1-2: General test parameters for FR2 SCell activation case with FR2 PSCell

Parameter	Unit	Value	Comment
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in section A.3.7.2.2

Table A.5.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell

Parameter <sup>Note 5</sup>	l lmi4		Cell 2			Cell 3	
Parameter	Unit	T1	T2	T3	T1	T2	T3
SSB ARFCN			freq2	•		freq2	
Duplex mode			TDD			TDD	
TDD configuration		•	TDDConf.3	3.1	•	TDDConf.3	.1
BW <sub>channel</sub>	MHz	1	00: N <sub>RB,c</sub> =	66	1	00: N <sub>RB,c</sub> =	66
PDSCH Reference measurement channel			SR.3.1 TD	D		SR.3.1 TDI	)
RMSI CORESET Reference Channel			CR.3.1 TD	D		CR.3.1 TDI	D
RMC CORESET Reference Channel		(	CCR.3.1 TI	DD	(	CCR.3.1 TD	D
OCNG Patterns				С	P.1		
SMTC configuration				SM	TC.1		
SSB configuration			SSB.1 FR2				
TCI state		TCI.State.0					
TRS configuration				TRS.2	2.1 TDD		
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS	dB				0		
EPRE ratio of PDSCH_DMRS to SSS	GD.				O		
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSSNote 1							
EPRE ratio of OCNG to OCNG DMRS Note							
1							
$\hat{E}_s/N_{oc}$	dB	TBD					
Propagation conditions				AV	VGN		

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: All parameters apply for configuration 1 and 2

Table A.5.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

Parameter <sup>Note 6</sup>	Unit	Cell 2			Cell 3		
Parameter	Unit	T1	T2	T3	T1	T2	Т3
Angle of arrival configuration		Accordin	ng to table	A.3.15.1	According to table A.3.15.1		A.3.15.1
$N_{oc}^{ m Note1}$	dBm/15kHz <sup>N</sup> ote4			TBD			
$N_{oc}^{$	dBm/SCS <sup>Note</sup>	TBD TBD					
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	TBD			TBD		
$\hat{E}_{s}/I_{ot}$	dB	TBD		TBD			
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	TBD TBD					

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the guiet zone
- Note 6: All parameters apply for configuration 1 and 2

## A.5.5.3.1.2 Test Requirements

The test requirements defined in section A.4.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $[T_{SMTC} \ SCell + 5ms]$  as defined in section 8.3.

# A.5.5.3.2 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160ms SCell measurement cycle

### A.5.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in section A.4.5.3.1.1, except PSCell is in FR2.

The supported test configurations are shown in table A.5.5.3.2.1-1 below. The general test parameters are the same in Tables A.4.5.3.1.1-2. The cell specific test parameters are given in Tables A.5.5.3.2.1-2. In this case, OTA related test parameters are the same as in table A.5.5.3.2.1-3.

Table A.5.5.3.2.1-1: Supported test configurations for FR1 SCell activation case with PSCell is FR2

Configuration	Description
1	FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE i	s only required to pass in one of the supported test configurations

Table A.5.5.3.2.1-2: Cell specific test parameters for FR1 SCell activation case with FR2 PSCell

Parameter		Unit		Cell 2	Cell 3		
		Olik	T1	T2 T3	T1 T2 T3		
SSB ARFCN	0		freq2		freq1		
Duplex mode	Config 1,4 Config 2,3,5,6	-	TDD TDD		FDD TDD		
	Config 1,4		TDDConf.3.1		Not Applicable		
TDD configuration	Config 2,5	1			TDDConf.1.1		
<b>3</b>	Config 3,6	-			TDDConf.2.1		
	Config 1,4				10: N <sub>RB,c</sub> = 52		
BW <sub>channel</sub>	Config 2,5	MHz	10	0: N <sub>RB,c</sub> = 66	10: N <sub>RB,c</sub> = 52		
	Config 3,6	1			40: N <sub>RB,c</sub> = 106		
	Config 1,4				10: N <sub>RB,c</sub> = 52		
BWP BW	Config 2,5		100: N <sub>RB,c</sub> = 66		10: N <sub>RB,c</sub> = 52		
	Config 3,6				40: N <sub>RB,c</sub> = 106		
DRx Cycle		ms	Not Applicable				
PDSCH Reference measurement channel	Config 1,4				SR.1.1 FDD		
	Config 2,5		;	SR.3.1 TDD	SR.1.1 TDD		
measurement channel	Config 3,6				SR.2.1 TDD		
RMSI CORESET	Config 1,4		CR.3.1 TDD		CR.1.1 FDD		
Reference Channel	Config 2,5				CR.1.1 TDD		
Reference Charmer	Config 3,6				CR.2.1 TDD		
RMC CORESET	Config 1,4				CCR.1.1 FDD		
Reference Channel	Config 2,5		C	CR.3.1 TDD	CCR.1.1 TDD		
Reference Charmer	Config 3,6				CCR.2.1 TDD		
OCNG Patterns				OP.1			
SMTC configuration				SMTC.1			
TCI state				TCI.State.0	NA		
	Config 1,4				TRS.1.1 FDD		
TRS configuration	Config 2,5		Т	RS.2.1 TDD	TRS.1.1 TDD		
	Config 3,6				TRS.1.2 TDD		
SSB configuration	Config 1,2,4,5			SSB.1 FR2	SSB.1 FR1		
SSB configuration	Config 3,6	1	`	DOD. I FKZ	SSB.2 FR1		
PDSCH/PDCCH	Config 1,2,4,5	kHz		120kH=	15kHz		
subcarrier spacing	Config 3,6	KΠZ	120kHz		30kHz		
EPRE ratio of PSS to SSS		dB			Ö		

EPRE ratio of PBCH DMRS	to SSS			
EPRE ratio of PBCH to PBC	H DMRS			
EPRE ratio of PDCCH DMR	S to SSS			
EPRE ratio of PDCCH to PD	OCCH DMRS			
EPRE ratio of PDSCH DMR	S to SSS			
EPRE ratio of PDSCH to PD	SCH			
EPRE ratio of OCNG DMRS				
EPRE ratio of OCNG to OCI	NG DMRS (Note 1)			
$N_{oc}^{}$ Note2	$N_{oc}^{$		TBD	[-104]
$N_{oc}^{}$ Note2	Config 1,2,4,5	dBm/SCS	TBD	[-104]
TV oc	Config 3,6	dbiii/303	TBD	[-101]
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		TBD	[17]
$\hat{E}_s/N_{oc}$		dB	TBD	[17]
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5	4Dm/CC	TBD	[-87]
Config 3,6		dBm/SCS	TBD	[-84]
SCH_RP Note 3		dBm/15 kHz	TBD	[-87]
Propagation condition		-	AW	GN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

Table A.5.5.3.2.1-3: OTA related test parameters for FR1 SCell activation case with FR2 PSCell

D	Parameter		Cell 2			Cell 3		
F	Unit	T1	T2	T3	T1	T2	T3	
Angle of arrival configuration			According to section A.3.15.1		NA			
$N_{oc}$ Note1		dBm/15kHz	TBD		[-104]			
λ/ Note1	Config 1,2,4,5	dBm/SCS	TBD		[-104]			
$N_{oc}^{$	Config 3,6	ubili/SCS	TBD		[-101]			
SS-RSRPNote2	Config 1,2,4,5	dBm/SCS		TBD		[-87]		
Config 3,6		Note3	TBD		[-84]			
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD		[17]			
Io <sup>Note2</sup>		dBm/95.04 MHz <sup>Note4</sup>	TBD		TBD			

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

### A.5.5.3.2.2 Test Requirements

The test requirements defined in section A.4.5.3.1.2 shall apply to this test case.

# A.5.5.3.3 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 320ms SCell measurement cycle

### A.5.5.3.3.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in section A.4.5.3.2.1, except PSCell is in FR2.

The supported test configurations are same as defined in section A.5.5.3.2.1. The general test parameters are the same as defined in section A.4.5.3.2.1. The cell specific test parameters are the same as in Tables A.5.5.3.2.1-2. In this case, OTA related test parameters are the same as in Table A.5.5.3.2.1-3.

#### A.5.5.3.3.2 Test Requirements

The test requirements defined in section A.4.5.3.2.2 shall apply to this test case.

### A.5.5.3.4 SCell Activation and deactivation of unknown SCell in FR1 in non-DRX

### A.5.5.3.4.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in section A.4.5.3.3.1, except PSCell is in FR2.

The supported test configurations are same as defined in section A.5.5.3.2.1. The general test parameters are the same as defined in section A.4.5.3.3.1. The cell specific test parameters are the same as in Tables A.5.5.3.2.1-2. In this case, OTA related test parameters are the same as in Table A.5.5.3.2.1-3.

### A.5.5.3.4.2 Test Requirements

The test requirements defined in section A.4.5.3.3.2 shall apply to this test case.

#### A.5.5.3.5 SCell Activation and deactivation of SCell in FR2 in non-DRX

### A.5.5.3.5.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell is in FR2.

The supported test configurations are shown in table A.5.5.3.5.1-1 below. The test parameters are the same except those described in the following section. The listed parameter values in Tables A.5.5.3.5.1-2 will replace the values of corresponding parameters in Tables A.5.5.3.5.1-2. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell (Cell 1), NR has two cells, PSCell (Cell 2) in FR1 and SCell (Cell 3) in FR2. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment [100ms] after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of cell 3 is increased to same level as for cell 2. The UE shall be able to report valid CSI for the activated SCell at latest in slot  $(m+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$  as defined in section 8.3 provided the SCell can be successfully detected on the first attempt. The UE shall start reporting CSI in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(m+1+[T_{HARO}])$  to  $(m+1+[T_{HARO}+3ms+T_{SMTC}]$  as defined in section 8.3.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell at latest in slot  $(n+[T_{HARQ}+3ms])$  as defined in clause 8.3, and any PCell and PSCell interruption due to the deactivation shall occur in the  $(n+1+[T_{HARQ}])$  to  $(n+1+[T_{HARQ}+3ms])$  as defined in section 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CQI reporting for SCell1 is discontinued.

Table A.5.5.3.5.1-1: FR2 SCell activation in non-DRX test configurations with FR1 PSCell

Configuration	Description
1	LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5	LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
6	LTE TDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE i	s only required to be tested in one of the supported test configurations

Table A.5.5.3.5.1-2: General test parameters for FR2 SCell activation case with FR1 PSCell

Parameter	Unit	Value	Comment
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1.
			As specified in clause A.3.7.2.2

Table A.5.5.3.5.1-3: Cell specific test parameters for FR2 SCell activation case with FR1 PSCell

Parameter		Unit	Cell 2		Cell 3			
		Unit	T1	T2	T3	T1	T2	Т3
SSB ARFCN			freq1		freq2			
Duplex mode	Config 1,4		FDD		TDD			
Duplex mode	Config 2,3,5,6		TDD		TDD			
	Config 1,4		No	ot Applicat	ole			
TDD configuration	Config 2,5		TDDConf.1.1		TDDConf.3.1			
	Config 3,6	TDDConf.2.1						
	Config 1,4		10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52 40: N <sub>RB,c</sub> = 106					
BW <sub>channel</sub>	Config 2,5	MHz			100: N <sub>RB,c</sub> = 66			
	Config 3,6							
	Config 1,4		10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52		100: N <sub>RB,c</sub> = 66			
BWP BW	Config 2,5							
	Config 3,6		40: $N_{RB,c} = 106$					
DRx Cycle		ms	Not Applicable					

	1					
PDSCH Reference	Config 1,4		SR.1.1 FDD			
measurement channel	Config 2,5		SR.1.1 TDD	SR.3.1 TDD		
measurement channel	Config 3,6		SR.2.1 TDD			
RMSI CORESET	Config 1,4		CR.1.1 FDD			
Reference Channel	Config 2,5		CR.1.1 TDD	CR.3.1 TDD		
Reference Channel	Config 3,6		CR.2.1 TDD			
DMC CODECET	Config 1,4		CCR.1.1 FDD			
RMC CORESET	Config 2,5		CCR.1.1 TDD	CCR.3.1 TDD		
Reference Channel	Config 3,6		CCR.2.1 TDD	7		
OCNG Patterns			OP.1			
SMTC configuration			SM	ITC.1		
TCI state			NA	TCI.State.0		
	Config 1,4		TRS.2.1 TDD			
TRS configuration	Config 2,5		TRS.1.1 TDD	TRS.2.1 TDD		
3	Config 3,6		TRS.1.2 TDD	1		
	Config 1,2,4,5		SSB.1 FR1			
SSB configuration	Config 3,6		SSB.2 FR1	SSB.1 FR2		
PDSCH/PDCCH	Config 1,2,4,5		15 kHz			
subcarrier spacing Config 3,6		kHz	30 kHz	120 kHz		
EPRE ratio of PSS to SSS			00 KH2			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMF	RS to SSS					
EPRE ratio of PDCCH to P	DCCH DMRS	dB	0			
EPRE ratio of PDSCH DMF						
EPRE ratio of PDSCH to P						
	EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OC	NG DMRS (Note 1)			1		
$N_{oc}^{}$ Note2		dBm/15kHz	[-104]	TBD		
λ/ Note2	Config 1,2,4,5	- dBm/SCS	[-104]	TBD		
$N_{oc}^{}$ Note2	Config 3,6		[-101]	TBD		
$\hat{\mathtt{E}}_{\scriptscriptstyle \mathrm{s}}/\mathtt{I}_{\scriptscriptstyle \mathrm{ot}}$		dB	[17]	TBD		
$\hat{E}_s/N_{oc}$		dB	[17]	TBD		
	Config 1,2,4,5	-ID (0.00	[-87]	TBD		
SS-RSRP <sup>Note3</sup>	Config 3,6	dBm/SCS	[-84]	TBD		
SCH_RP Note 3		dBm/15 kHz	[-87]	TBD		
Propagation condition		-	- AWGN			
	so used such that ha	th calla ara fully		al transmitted newer spectral		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

Table A.5.5.3.5.1-4: OTA related test parameters for FR2 SCell activation case with FR1 PSCell

Parameter		Unit	Cell 2			Cell 3		
		Unit	T1	T2	T3	T1	T2	T3
Angle of arrival configuration			NA		According to clause A.3.15.1			
$N_{oc}^{}$ Note1		dBm/15kHz	[-104]		TBD			
<b>λ</b> / Note1	Config 1,2,4,5	dBm/SCS	[-104]		TBD			
$N_{oc}^{}$ Note1	Config 3,6	ubili/SCS	[-101]		TBD			
SS-RSRP <sup>Note2</sup>	Config 1,2,4,5	dBm/SCS	[-87]		TBD			
	Config 3,6	Note3	[-84]		TBD			
$\hat{\mathbf{E}}_{_{\mathrm{s}}}/\mathbf{I}_{_{\mathrm{ot}}}$		dB	[17]		TBD			
Io <sup>Note2</sup>		dBm/95.04 MHz <sup>Note4</sup>	TBD		TBD			

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each
  - receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.5.5.3.5.2 Test Requirements

The test requirements defined in clause A.5.5.3.5.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [TBD\* $T_{SMTC\ SCell}$ +5 ms] as defined in clause 8.3.

# A.5.5.4 UE UL carrier RRC reconfiguration Delay

# A.5.5.5 Beam Failure Detection and Link recovery procedures

# A.5.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

#### A.5.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.1.1-1, A.5.5.5.1.1-2, A.5.5.5.1.1-3 and A.5.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.5.5.5.1.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
2	LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only r	equired to pass in one of the supported test configurations in FR2

Table A.5.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
A (' E LITEA DO			0.11.4	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number		<del>                                     </del>	1	
Active PCell		<del>                                     </del>	Cell 2	
RF Channel Numbe			2 TDD	
Duplex mode	Config 1, 2			
BW <sub>channel</sub>	Config 1, 2	<del>                                     </del>	100: N <sub>RB,c</sub> = 66	
DL initial BWP	Config 1, 2		DLBWP.0.1	
configuration	0 " 1 0		DI DIVID 4 4	
DL dedicated	Config 1, 2		DLBWP.1.1	
BWP configuration UL initial BWP	0		LII DWD 0.4	
	Config 1, 2		ULBWP.0.1	
configuration	Config 1 0	<del>                                     </del>	ULBWP.1.1	
UL dedicated	Config 1, 2		ULBWP.1.1	
BWP configuration	0 " 1 0		TDD0 (04	
TDD Configuration	Config 1, 2		TDDConf.3.1	
CORESET	Config 1		CR. 3.1 TDD	
Reference				
Channel	0 " 1 0	<del>                                     </del>	000 4 500	
SSB Configuration	Config 1, 2		SSB.1 FR2	
SMTC	Config 1, 2		SMTC.1	
Configuration	,			
- C				
PDSCH/PDCCH Config 1, 2			120 KHz	
subcarrier spacing	subcarrier spacing			
DD A OLL	0 " 1 0		T.I. A.O.O.A	
PRACH Config 1, 2			Table A.3.8.3.4	
Configuration				
CCD index contained to DED DC (a.)		+	0	
SSB index assigned as BFD RS (q <sub>0</sub> )			0	
SSB index assigned	as CBD RS (q <sub>1</sub> )		1	
TCI Configuration Config 1, 2			TBD	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna			2x2 Low	
Configuration				
DCI format			1-0	
Number of	f Control OFDM		2	
symbols				
Aggregation	on level	CCE	8	

Beam failure PDCCH RE energy to detecti on Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0		
transm ission param eters	Ratio of hypothe PDCCH DMRS e average CSI-RS	energy to	dB	0	
	DMRS precoder	granularity		REG bundle size	
	REG bundle size	)		6	
DRX				OFF	
Gap patt	tern ID			gp0	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-Thre	rsrp-ThresholdSSB		dBm	[-94.5]	Threshold used for Qout_LR_SSB
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS	
beamFa	beamFailureInstanceMaxCount			n2	see TS 38.321 [7], section 5.17
beamFa	beamFailureDetectionTimer			pbfd4	see TS 38.321 [7], section 5.17
	configuration	Config 1, 2		[CSI-RS.3.3 TDD]	
TCI state				[TCI.State.0]	
	CSI-RS for tracking Config 1, 2			[TRS.2.1 TDD]	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1	
T2		S	0.4		
T3			S	[0.6]	
T4			S	[0.4]	
T5			S	[1.4]	
D1			S	[0.44]	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.5.5.5.1.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit	Unit Test 1					Test 1					
			SSB of set q <sub>0</sub>				SSB of set q <sub>1</sub>					
		T1	T2	Т3	T4	T5	T1	T2	T3	T4	T5	
EPRE ratio of PDCCH DMRS to SSS	dB											
EPRE ratio of PDCCH to PDCCH DMRS	dB											
EPRE ratio of PBCH DMRS to SSS	dB											
EPRE ratio of PBCH to PBCH DMRS	dB			0					0			
EPRE ratio of PSS to SSS	dB											
EPRE ratio of PDSCH DMRS to SSS	dB											
EPRE ratio of PDSCH to PDSCH DMRS	dB											
EPRE ratio of OCNG DMRS to SSS	dB											
SNR Config 1, 2	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]	
N <sub>oc</sub> Config 1, 2	dBm/1 5KHz			[-98]					[-98]			
Propagation condition			Т	DLA30-	<b>7</b> 5			TE	DLA30-7	<b>'</b> 5		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.												
	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time											
	·											
Note 5: The timers and layer										riod T1.		
	5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.											

- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.5.5.5.1.1-4: Measurement gap configuration for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Field	Test 2
Field	Value
gapOffset	0

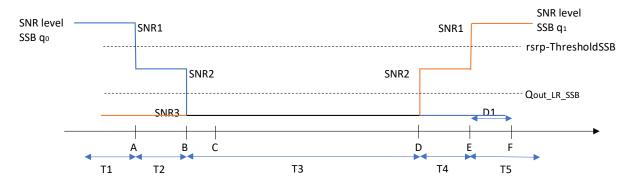


Figure A.5.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.5.5.5.1.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

#### A.5.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.2.1-1, A.5.5.5.2.1-2, A.5.5.5.2.1-3, A.5.5.5.2.1-4 and A.5.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity

of [2] ms. In the test, DRX configuration is enabled in PCSell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.5.5.5.2.1-1: Supported test configurations for FR2 PSCell

Configuration	Description							
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth							
2	LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth							
Note: The UE is onl	The UE is only required to pass in one of the supported test configurations in FR2							

Table A.5.5.5.2.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCe	ll .		Cell 1	
E-UTRA RF Channe			1	
Active PCell	or realison		Cell 2	
RF Channel Numbe	r		2	
Duplex mode	Config 1, 2		TDD	
BW <sub>channel</sub>	Config 1, 2		100: N <sub>RB,c</sub> = 66	
DL initial BWP	Config 1, 2		DLBWP.0.1	
configuration				
DL dedicated BWP	Config 1, 2		DLBWP.1.1	
configuration				
UL initial BWP	Config 1, 2		ULBWP.0.1	
configuration	-			
UL dedicated BWP	Config 1, 2		ULBWP.1.1	
configuration				
TDD Configuration	Config 1, 2		TDDConf.3.1	
CORESET	Config 1		CR. 3.1 TDD	
Reference				
Channel				
SSB Configuration	Config 1, 2		SSB.1 FR2	
SMTC	Config 1, 2		SMTC.1	
Configuration				
_				
PDSCH/PDCCH	Config 1, 2		120 KHz	
subcarrier spacing				
PRACH	Config 1, 2		Table A.3.8.3.4	
Configuration	Corning 1, 2		Table A.S.6.3.4	
Comiguration				
SSB index assigned	as BFD RS (q <sub>0</sub> )		0	
_				
SSB index assigned	as CBD RS (q <sub>1</sub> )		1	
TCI Configuration	Config 1, 2		TBD	
, and the second	J ,			
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix a	nd Antenna		2x2 Low	
Configuration				
DCI forma	t		1-0	

Beam	Number of Cont	rol OFDM		2	
failure detecti	symbols	al.	CCE	9	
on	Aggregation leve	tion!	dB	<u>8</u> 0	
transm ission param	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		αв	U	
eters	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0	
	DMRS precoder	granularity		REG bundle size	
	REG bundle size	Э		6	
DRX	•			DRX.7	A.3.3.7
Gap patt				gp0	
rlmInSyr	rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-Thre	rsrp-ThresholdSSB			[-94.5]	Threshold used for Q <sub>out_LR_SSB</sub>
powerCo	powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFa	ilureInstanceMaxC	Count		n2	see TS 38.321 [7], section 5.17
beamFa	ilureDetectionTime	er		pbfd4	see TS 38.321 [7], section 5.17
CSI-RS	configuration	Config 1, 2		[CSI-RS.3.3 TDD]	
TCI state				[TCI.State.0]	
CSI-RS	for tracking	Config 1, 2		[TRS.2.1 TDD]	
T1			S	1	During this time the the UE shall be fully synchronized to cell 1
T2			S	0.4	
T3			S	[0.6]	
T4			S	[0.4]	
T5			S	[1.4]	
D1			S	[0.44]	
Note 1:	UE-specific PD	CCH is not trar	nsmitted afte	er 11 starts.	

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.5.5.5.2.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Para	Unit	Test 1					Test 1					
		SSB of set q <sub>0</sub>				SSB of set q <sub>1</sub>						
			T1	T2	Т3	T4	T5	T1	T2	T3	T4	T5
AoA setup			S	etup 3	defined	in A.3.1	5	Ś	etup 3 d	efined i	n A.3.1	5
EPRE ratio of F	PDCCH DMRS to	dB										
EPRE ratio of PDCCH to PDCCH DMRS		dB										
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB			0					0		
EPRE ratio of F	PSS to SSS	dB										
EPRE ratio of F	PDSCH DMRS to	dB										
EPRE ratio of F PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS		dB										
SNR	Config 1, 2	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
1 //		dBm/15 KHz	[-98]			[-98]						
Propagation co	Propagation condition			TDLA30-75			TDLA30-75					
Note 1: OCN												

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.2.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.5.5.5.2.1-4: Measurement gap configuration for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Field	Test 2
rieid	Value
gapOffset	0

Table A.5.5.5.2.1-5: Void

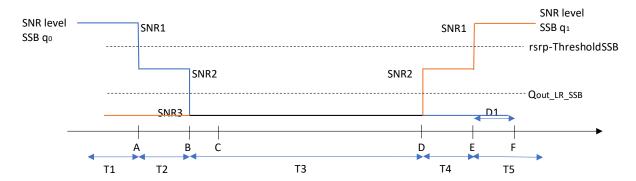


Figure A.5.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.5.5.5.2.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.5.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q<sub>0</sub> configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q<sub>1</sub>. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.3.1-1, A.5.5.5.3.1-2, and A.5.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.3.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.5.5.3.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.5.5.3.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Pa	rameter	Unit	Value	Comment		
			Test 1			
Active E-UTRA F			Cell 1			
E-UTRA RF Cha	nnel Number		1			
Active PSCell			Cell 2			
RF Channel Num			2			
Duplex mode	Config 1		TDD			
TDD	Config 1		TDDConf.3.1			
Configuration						
CORESET	Config 1		CR.3.1 TDD	A.3.1.2		
Reference						
Channel						
SSB	Config 1		SSB.1 FR2	A.3.10		
Configuration						
SMTC	Config 1		SMTC.1	A.3.11		
Configuration						
PDSCH/PDCC	Config 1		120 KHz			
H subcarrier						
spacing						
	igned as beam failure		[0]			
detection RS in s						
TRS configuratio			TRS.2.1 TDD			
TCI configuration			CSI-RS.Config.0			
OCNG paramete	rs		OP.1	A.3.2.1		
CP length			Normal			
Correlation Matri: Configuration	x and Antenna		2x2 Low			
Beam failure	DCI format		1-0			
detection transmission	Number of Control OFDM symbols		2			
parameters	Aggregation level	CCE	8			
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		0			
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0			
	DMRS precoder granularity		REG bundle size			
	REG bundle size		6			
DRX			OFF			
Gap pattern ID			N.A.			
csi-RS-Index ass	igned as candidate		1			
beam detection F	RS in set q <sub>1</sub>					

rlmInSyncOutOfS	SyncThreshold		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).	
rsrp-ThresholdS	SB	dBm	[-94.5]	Threshold used for Q <sub>in_LR_SSB</sub>	
powerControlOffs	setSS		NA	Used for deriving rsrp- ThresholdCSI-RS	
beamFailureInsta	anceMaxCount		[n2]	see TS 38.321 [7], section 5.17	
beamFailureDete	ectionTimer		[pbfd4]	see TS 38.321 [7], section 5.17	
CSI-RS configuration	Config 1		CSI-RS.3.2 TDD	A.3.14.2	
T1		s	1	During this time the the UE shall be fully synchronized to cell 1	
T2		S	0.4		
T3		S	[0.6]		
T4	T4		[0.4]		
T5	·	S	[1.4]		
D1	·	S	[0.24]		
Note 1: UE-sp	ecific PDCCH is not t	ransmitted afte	r T1 starts.		

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.5.5.5.3.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Par	ameter	Unit			Test 1			Test 1				
			CSI-RS of set q <sub>0</sub>						CSI	-RS of se	et q <sub>1</sub>	
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ra	tio of PSS	dB		•					•			•
to SSS												
EPRE ra	tio of PBCH	dB										
DMRS to	SSS											
	tio of PBCH	dB										
to PBCH												
EPRE ra		dB										
	DMRS to											
SSS												
EPRE ra		dB										
	to PDCCH				•					•		
DMRS		Ē			0					0		
EPRE ra		dB										
SSS	DMRS to											
EPRE ra	tio of	dB										
	to PDSCH	ub										
DMRS	0100011											
	tio of OCNG	dB										
	SSS <sup>(Note 1)</sup>	42										
	tio of OCNG	dB										
	DMRS (Note											
1)												
SNR_C	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[10]
SI-RS	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[10]
	Config 3	1	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[10]
$N_{oc}$	Config 1	dBm/		[-98]						[-98]	-	
1 voc	Config 2	15K	[-98]							[-98]		
	Config 3	Hz		[-98]					[-98]			
Propagat				TDL-A 30ns 75Hz					TDL	-A 30ns 7	′5Hz	
condition												
Note 1:	OCNG shall	I be used	d such th	at the res	sources in	Cell 1 au	e fully all	ocated a	nd a cons	stant total	transmitt	ted

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.5.5.5.3.1-4: Void

Table A.5.5.5.3.1-5: Void

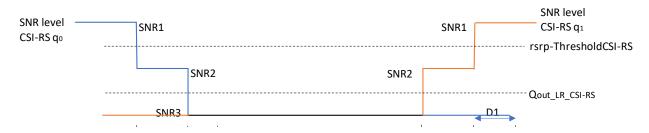


Figure A.5.5.3.1-1: SNR variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

#### A.5.5.5.3.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.5.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.4.1-1, A.5.5.5.4.1-2, A.5.5.5.4.1-3, and A.5.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.4.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.5.5.5.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.5.5.5.4.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter	Unit	Value	Comment
		Test 1	
Active E-UTRA PCell		Cell 1	
E-UTRA RF Channel Number		1	
Active PSCell		Cell 2	
RF Channel Number		2	
Duplex mode Config 1		TDD	

	1		I	
TDD	Config 1		TDDConf.3.1	
Configuration	Coming i		וווטטעע ו .ט.וו	
CORESET	Config 1		CR.3.1 TDD	A.3.1.2
Reference	Comig		OR.3.1 100	7.5.1.2
Channel				
SSB	Config 1		SSB.1 FR2	A.3.10
Configuration	Comig		COD.TTRE	71.0.10
SMTC	Config 1		SMTC.1	A.3.11
Configuration	J Somig :		O O	7
PDSCH/PDCC	Config 1		120 KHz	
H subcarrier	l same			
spacing				
	gned as beam failure		[0]	
detection RS in se			[-1	
TRS configuration			TRS.2.1 TDD	
TCI configuration			CSI-RS.Config.0	
OCNG parameter			OP.1	A.3.2.1
CP length	-		Normal	-
Correlation Matrix	and Antenna	1	2x2 Low	
Configuration				
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols			
parameters	Aggregation level	CCE	8	
	Ratio of hypothetical	dB	0	
	PDCCH RE energy to			
	average CSI-RS RE			
	energy			
	Ratio of hypothetical	dB	0	
	PDCCH DMRS	~	· ·	
	energy to average			
	CSI-RS RE energy			
	DMRS precoder		REG bundle size	
	granularity			
	REG bundle size		6	
DRX	•		DRX.7	A.3.3.7
Gap pattern ID			*[ <i>gp0</i> ]	
	igned as candidate		1	
beam detection R				
rlmInSyncOutOfS	yncThreshold		absent	When the field is
				absent, the UE
				applies the value
				0. (Table 8.1.1-1).
rsrp-ThresholdSS	SB	dBm	-94.5	Threshold used
				for Q <sub>in_LR_SSB</sub>
powerControlOffs	etSS		NA	Used for deriving
				rsrp-
			_	ThresholdCSI-RS
beamFailureInsta	nceMaxCount		[n2]	see TS 38.321
				[7], section 5.17
beamFailureDetectionTimer			[pbfd4]	see TS 38.321
001.00			001 00 0 0 777	[7], section 5.17
CSI-RS	Config 1		CSI-RS.3.2 TDD	A.3.14.2
configuration			,	<b>D</b> : a: a
T1		S	1	During this time
				the the UE shall
				be fully
				synchronized to
				cell 1

T2	S	0.4			
T3	S	[0.6]			
T4	S	[0.4]			
T5	S	[1.4]			
D1	S	[0.44]			
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.5.5.5.4.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Para	ameter	Unit	Test 1		Test 1							
			CSI-RS of set q₀			CSI	-RS of se	et q <sub>1</sub>				
			T1	T2	Т3	T4	T5	T1	T2	T3	T4	T5
EPRE rat	tio of PSS	dB										
EPRE rat	tio of PBCH SSS	dB										
EPRE rat	tio of PBCH DMRS	dB										
EPRE rat PDCCH I SSS		dB										
EPRE rat PDCCH t DMRS	tio of to PDCCH	dB			0					0		
EPRE rat PDSCH I SSS		dB										
EPRE rate	tio of to PDSCH	dB										
	tio of OCNG SSS <sup>(Note 1)</sup>	dB										
	tio of OCNG DMRS (Note	dB										
SNR_C	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[10]
SI-RS	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[10]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12	[-12]	[-12]	[-3]	[10]
$N_{oc}$	Config 1	dBm/			[-98]		-	_		[-98]		
1 voc	Config 2	15K			[-98]					[-98]		
	Config 3	Hz			[-98]					[-98]		
Propagat condition	ion			TDL	-A 30ns 7	'5Hz			TDL	-A 30ns 7	'5Hz	

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.5.5.5.4.1-4: Measurement gap configuration for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Field	Test 1
rieid	Value
gapOffset	[0]

Table A.5.5.5.4.1-5: Void

Table A.5.5.5.4.1-6: Void

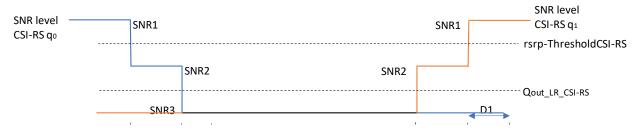


Figure A.5.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.5.5.5.4.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.6 Active BWP switch delay

## A.5.5.6.1 DCI-based and Timer-based Active BWP Switch

# A.5.5.6.1.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

#### A.5.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 section 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 section 7.32.2.7. Supported test configurations are shown in Table A.5.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific

parameters of NR PSCell is specified in Table A.5.5.6.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.6.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PSCell's slot  $(i+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from slot  $(i+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at PSCell's slot  $(j+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from slot  $(j+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

Table A.5.5.6.1.1.1-1: DL BWP switch supported test configurations

	Config	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations
Note 2:	A UE which fulfil	s the requirements in test case A.5.5.2.2 can skip the test cases in A.5.5.2.1.

Table A.5.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		ı	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	uБ	0	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.5.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Cell 2
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66
Active BWP ID		1, 2
Initial DL BWP Configuration		DLBWP.0.2 Note 2
Active DL BWP-1 Configuration		DLBWP.1.1 Note 2
Active DL BWP-2 Configuration		DLBWP.1.3 Note 2
Initial UL BWP Configuration		ULBWP.0.2 Note 2
Active UL BWP-1 Configuration		ULBWP.1.1 Note 2
Active UL BWP-2 Configuration		ULBWP.1.3 Note 2
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State		TCI.State.0
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna		1x2 Low
Configuration		
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note		
1)		
Propagation Condition		AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

Table A.5.5.6.1.1.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

	Parameter	Unit	Cell 2				
Angle of ar	rival configuration		According to section				
			A.3.15.1				
N <sub>oc</sub> Note 1		dBm/15	TBD				
		kHz					
Noc <sup>Note 1</sup>		dBm/SCS	TBD				
SS-RSRP	Note 2	dBm/120	TBD				
		kHz Note3					
Ês/Iot		dB	TBD				
Io <sup>Note2</sup>		dBm/95.04	TBD				
		MHz Note4					
Note 1:	Interference from other cells and n	oise sources r	not specified in the test is				
	assumed to be constant over subc	arriers and tim	ne and shall be modelled as				
	AWGN of appropriate power for N	oc to be fulfilled	d.				
Note 2:	SS-RSRP and lo levels have beer	derived from	other parameters for				
	information purposes. They are not settable parameters themselves.						
Note 3:	ote 3: SS-RSRP minimum requirements are specified assuming independent						
	interference and noise at each receiver antenna port.						
Note 4:	Equivalent power received by an a	intenna with 0	dBi gain at the centre of the				
	quiet zone						
Note 5: A	s observed with 0dBi gain antenna	at the centre	of the quiet zone.				

#### A.5.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelav}+k1)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Section 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot (i+YI), (j+Y2), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: whether E-UTRA PCell's interruption test requirement is needed or not depends on whether E-UTRA Pcell's interruption could be tested when PSCell is FR2 cell.

### A.5.5.6.1.2 E-UTRAN – NR PSCell FR2 DL active BWP switch with FR2 SCell in non-DRX in synchronous EN-DC

## A.5.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in section 8.6.2, and interruption requirements for NR victim cell defined in section 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in TS36.133 section 7.32.2.7. Supported test configurations are shown in Table A.5.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.5.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 3 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PSCell's slot  $(i+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from slot  $(i+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

#### During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at PSCell's slot  $(j+T_{BWPswitchDelay})$  as defined in section 8.6 and starts to report valid ACK/NACK for the PSCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from slot  $(j+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR SCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell and SCell during BWP switch of PSCell, respectively.

Table A.5.5.6.1.2.1-1: DL BWP switch supported test configurations

	Config	Description			
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note 1:	The UE is only required to be tested in one of the supported test configurations				
Note 2:	A UE which fulfils the requirements in test case A.5.5.6.1.2 can skip the test cases in A.5.5.6.1.1.				
Note 3:	NR configuration	is the same for PSCell and SCells.			

Table A.5.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		l	test
NR RF Channel Number		2, 3	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
Active SCell		Cell 3	SCell on RF channel number 3.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	U	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	UD	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on SCC.
on RF channel number 3	GD.	0	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
Cell3 timing offset to cell2	μS	3	Synchronous cells
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.5.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Cell 2	Cell 3
Frequency Range		FF	R2
Duplex mode		TI	DD .
TDD configuration		TDDC	onf.3.1
BW <sub>channel</sub>		100 MHz:	$N_{RB,c} = 66$
Active BWP ID		1, 2	0
Initial DL BWP Configuration		DLBWP.0.2	DLBWP.0.2
Active DL BWP-0 Configuration		NA	DLBWP.0.2
Active DL BWP-1 Configuration		DLBWP.1.3	NA
Active DL BWP-2 Configuration		DLBWP.1.1	NA
Initial UL BWP Configuration		ULBWP.0.2	ULBWP.0.2
Active UL BWP-0 Configuration		NA	ULBWP.0.2
Active UL BWP-1 Configuration		ULBWP.1.3	NA
Active UL BWP-2 Configuration		ULBWP.1.1	NA
PDSCH Reference measurement channel		SR.3.	1 TDD
RMSI CORESET parameters		CR.3.	1 TDD
Dedicated CORESET parameters		CCR.3	.1 TDD
OCNG Patterns		OF	P.1
SSB Configuration		SSB.	1 FR2
SMTC Configuration		SM	ΓC.1
TCI State		TRS.2	.1 TDD
TRS Configuration		TCI.S	state.0
Antenna Configuration		1:	x2
Propagation Condition		AW	'GN
EPRE ratio of PSS to SSS	dB	0	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS	1		
EPRE ratio of PDSCH DMRS to SSS	4		
EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1)	4		
EPRE ratio of OCNG DMRS to SSS(Note 1)	1		
Nata 4: OONO aball bases all avails that has			tal taanaasitta dha accan

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3.

Table A.5.5.6.1.2.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

	Parameter	Unit	Cell 2	Cell 3
	arrival configuration		According to clause A.3.15	According to clause A.3.15
N <sub>oc</sub> Note 1		dBm/15	TBD	TBD
		kHz		
SS-RSRI	Note 2	dBm/120	TBD	TBD
		kHz Note3		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	TBD	TBD
Io <sup>Note2</sup>		dBm/95.04	TBD	TBD
		MHz Note4		
Note 1:	Interference from other cells and r	oise sources r	not specified in the test is assum	ed to be constant over
	subcarriers and time and shall be	modelled as A'	WGN of appropriate power for N	l <sub>oc</sub> to be fulfilled.
Note 2:	SS-RSRP and lo levels have beer	derived from	other parameters for information	purposes. They are not
	settable parameters themselves.			
Note 3:	SS-RSRP minimum requirements	are specified a	assuming independent interferen	ce and noise at each receiver
	antenna port.			
Note 4:	Equivalent power received by an a			t zone
Note 5:	As observed with 0dBi gain antenr	na at the centre	e of the quiet zone.	

#### A.5.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelay}+k1)$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Section 7.32.2.7.

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in Section 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot  $(i+T_{BWPswitchDelay}+k1)$ ,  $(j+T_{BWPswitchDelay}+k1)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: FFS value of k1 for type 1 and type 2 UE.

#### A.5.5.6.2 RRC-based Active BWP Switch

A.5.5.6.2.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

#### A.5.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.5.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.5.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.5.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with bandwidth part configuration BWP-2, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PSCell's slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$  as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in section 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including BWP switch command is sent till the time when RRC Reconfiguration Complete message is received.

Table A.5.5.6.2.1.1-1: DL BWP switch supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only requ	uired to be tested in one of the supported test configurations

Table A.5.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		4	One E-UTRA radio channel is used for this
Number		l	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	

Table A.5.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

	Parameter	Unit	Cell 2					
Frequenc	y Range		FR2					
Duplex m			TDD					
TDD conf			TDDConf.3.1					
BW <sub>channel</sub>			100 MHz: N <sub>RB,c</sub> = 66					
Active BV			1, 2					
Initial DL	BWP Configuration		DLBWP.0.2					
	•							
Active DL	BWP-1 Configuration		DLBWP.1.3					
	BWP-2 Configuration		DLBWP.1.1					
	BWP Configuration		ULBWP.0.2					
	BWP-1 Configuration		ULBWP.1.3					
	BWP-2 Configuration		ULBWP.1.1					
	Reference measurement channel		SR.3.1 TDD					
	RESET parameters		CR.3.1 TDD					
	d CORESET parameters		CCR.3.1 TDD					
OCNG Pa			OP.1					
SSB Con			SSB.1 FR2					
	onfiguration		SMTC.1					
TCI State			TCI.State.0					
TRS Con			TRS.2.1 TDD					
	Configuration		1x2					
	ion Condition		AWGN					
	o of PSS to SSS	dB	0					
EPRE ratio	o of PBCH DMRS to SSS		-					
	of PBCH to PBCH DMRS							
	o of PDCCH DMRS to SSS							
	o of PDCCH to PDCCH DMRS							
	o of PDSCH DMRS to SSS							
	o of PDSCH to PDSCH							
	o of OCNG DMRS to SSS(Note 1) o of OCNG to OCNG DMRS (Note 1)	-						
Note 1:	OCNG shall be used such that both	th colle are full	v allocated and a constant					
Note 1.	total transmitted power spectral de							
Note 2:	Interference from other cells and r							
11010 2.	assumed to be constant over subd							
	as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled.							
Note 3:	SS-RSRP and lo levels have been							
	information purposes. They are no							
Note 4:	For unpaired spectrum, a DL BWF							
	is linked with ULBWP.0.2; DLBWF							
	DLBWP.1.3 is linked with ULBWP							
	TS 38.213 [3].							

Table A.5.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

Para	meter	Unit	Cell 2	
Angle of arrival config	guration		According to table A.3.15	
	NR_TDD_FR2_A			
	NR_TDD_FR2_B	dBm/15kHz		
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F		TBD	
	NR_TDD_FR2_G		IBD	
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
NR_TDD_FR2_A				
$N_{oc}^{\rm Note1}$	NR_TDD_FR2_B	dBm/SCS	TBD	
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			

	NR_TDD_FR2_T					
	NR_TDD_FR2_Y					
	NR_TDD_FR2_A					
	NR_TDD_FR2_B					
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	TBD			
00-10101	NR_TDD_FR2_G	Note3	166			
	NR_TDD_FR2_T					
	NR_TDD_FR2_Y					
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		dB	TBD			
	NR_TDD_FR2_A					
	NR_TDD_FR2_B	]				
lo <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04 MHz <sup>Note4</sup>	TBD			
10	NR_TDD_FR2_G		100			
	NR_TDD_FR2_T					
	NR_TDD_FR2_Y					
assume	Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{ac}$ to be fulfilled.					
	ote 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
Note 3: SS-RSF	RP minimum requirements ence and noise at each re	are specified as	ssuming independent			
	ent power received by an	•	Bi gain at the centre of the			

#### A.5.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in a slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.7 PSCell addition and release delay

#### A.5.5.7.1 Addition and Release Delay of NR PSCell

#### A.5.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 of TS 36.133 [15] for the case when the PSCell is unknown by the UE at the time of addition.

Supported test configurations are shown in A.5.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.5.5.7.1.1-2 and cell-specific parameters in A.5.5.7.1.1-3 below. The test consists of four successive time periods with duration of T1, T2, T3 and T4. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T1. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T2.

The test system shall observe the periodic reporting of CSI for PSCell during T3. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T3.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T3, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

Table A.5.5.7.1.1-1: Supported test configurations for FR2 PSCell

Configuration Description					
1	LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz				
2	LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz				
Note: The UE is only	y required to be tested in one of the supported test configurations				

Table A.5.5.7.1.1-2: General Test Parameters for PSCell Addition and Release

Par	ameter	Unit	Value	Comment		
RF Channel N	lumber		1, 2	Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell		
Initial	Active PCell		Cell1	PCell on RF channel number 1.		
Condition	Neighbour cell		Cell2	Neighbour cell on RF channel number 2.		
Final	Active PCell		Cell1	PCell on RF channel number 1.		
Condition	Neighbour Cell		Cell2	PSCell on RF channel number 2.		
A4	Hysteresis	dB	0	Hysteresis for evaluation of event A4.		
	Threshold RSRP	dBm	-93	Actual RSRP threshold for event A4. Needs to take absolute accuracy tolerance in section 9.1.11.1 into account plus margin.		
	Time to Trigger	S	0			
DRX			OFF	Continuous monitoring of primary cell		
PRACH config	guration on cell2		FR2 configuration 2	Captured in [A.3.8.3.2]		
CQI/PMI perio configuration i	dicity and offset ndex on cell2		TBD	CQI reporting for PSCell every uplink subframe		
Cell-individual RF channel nu	offset for cells on umber 1	dB	0	Individual offset for cells on primary component carrier.		
	Cell-individual offset for cells on RF channel number 2		YE		0	Individual offset for cells on carrier frequency of cell2.
T1		s	5	During this time the PCell shall be known and cell2 shall be unknown.		
T2	T2		1	During this time the UE adds the PSCell.		
T3	T3		1	During this time the UE sends CSI reports for PSCell.		
T4		S	1	During this time the UE releases the PSCell.		

Table A.5.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

Donomoton	l lmi4	Confin	Test			
Parameter	Unit	Config	T1 T2 T3			
E-UTRA Channel		1,2		1		
Number						
NR Channel Number		1,2		2		
Duplex Mode		1,2		TDD		
TDD configuration	N 41 1	1,2		TDDCon		
BW <sub>channel</sub>	MHz	1,2	10	00: NRB,		
Initial BWP		1,2		DLBWP		
Configuration Dedicated BWP				ULBWP DLBWP		
Configuration		1,2		ULBWP		
TRS Configuration		1	-	TRS.2.1		
TCI State		1	C:	SI-RS.Co	onfig.0	
PDSCH Reference		1,2		SR.3.1 7	ΓDD	
measurement channel		,				
RMSI CORESET		1,2		CR.3.1	ΓDD	
Reference Channel Dedicated CORESET						
Reference Channel		1,2		CCR.3.1	TDD	
OCNG Patterns		1,2		OP.1		
SSB configuration		1,2	SSB.1 FR2			
SMTC configuration		1,2		SMTC		
EPRE ratio of PSS to		1,2		OWITO		
SSS						
EPRE ratio of PBCH						
DMRS to SSS						
EPRE ratio of PBCH to						
PBCH DMRS						
EPRE ratio of PDCCH						
DMRS to SSS						
EPRE ratio of PDCCH						
to PDCCH DMRS	dB	1,2		0		
EPRE ratio of PDSCH						
DMRS to SSS						
EPRE ratio of PDSCH						
to PDSCH EPRE ratio of OCNG						
DMRS to SSS(Note 1)						
EPRE ratio of OCNG						
to OCNG DMRS (Note						
1)						
$N_{oc}^{\text{Note2}}$	dBm/15 kHz	1,2	N/A		TBD	
$N_{oc}^{ m Note2}$	dBm/SCS	1,2	N/A		TBD	
	ubiii/303	1,4	IN/A	1	טטו	
$\hat{E}_{s}/I_{ot}$		1,2	-infinity		TBD	
$\hat{E}_s/N_{oc}$		1,2	-infinity		TBD	
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2	-infinity		TBD	
Io <sup>Note3</sup>	dBm/95MHz	1,2	N/A		TBD	
Propagation condition		1,2		AWG		

# A.5.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest [732]  $ms^{Note1}$  into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest [20] ms into T5.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 of TS 36.133 [15]:

$$T_{config~PSCell} = T_{RRC~delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell~DU} + 2ms$$

Where:

 $T_{RRC\_delay} = 20 ms$ 

 $T_{processing} = 40 ms$ 

 $T_{search} = 8*3*20 = 480 \text{ ms}$ 

 $T_{\Delta} = 20 ms$ 

 $T_{PSCell\ DU} = 16*10+10 = 170 \text{ ms}$ 

# A.5.6 Measurement procedure

## A.5.6.1 Intra-frequency Measurements

## A.5.6.1.1 EN-DC event triggered reporting test without gap under non-DRX

## A.5.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.1.1-1.

Table A.5.6.1.1.1-1: supported test configurations

Configuration	Description				
1	LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
3	LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
4	LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations.					

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.1.1-2, A.5.6.1.1.1-3 and A.5.6.1.1.1-4 below.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

Parameter	Unit	Config	Value	Comment
Active cell			E-UTRAN	
		1~4	PCell (Cell 1)	
		1~4	PSCell (Cell	
			2)	
Neighbour cell		1~4	Cell 3	Cell to be identified.
RF Channel Number			1: Cell 1	One TDD carrier frequency is used for the NR cells
		1~4	2: Cell 2 and	and one TDD or FDD carrier frequency is used for E-
			Cell 3	UTRAN cell.
SMTC configuration		1~4	SMTC.1	
A3-Offset	dB	1~4	-6	
CP length		1~4	Normal	
Hysteresis	dB	1~4	0	
Time To Trigger	S	1~4	0	
Filter coefficient		1~4	0	L3 filtering is not used
DRX		1~4	OFF	
Time offset between		1~4	3 μs	Synchronous EN-DC
Cell 1 and Cell 2		1~4		
Time offset between		1~4	3 μs	Synchronous cells
Cell 2 and Cell 3		1~4		
T1	S	1~4	5	
T2	S	1~4	5	

Table A.5.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

Parameter	Unit	Config	Се	Cell 2 T1 T2		II 3	
			T1			T2	
TDD configuration		1~4	TDDC	TDDConf.3.1		TDDConf.3.1	
Intial BWP		1~4	DLBW	/P.0.1	DLBW	DLBWP.0.1	
configuration			ULBW	/P.0.1	ULBWP.0.1		
Active DL BWP		1~4	DLBW	/P.1.1	DLBW	/P.1.1	
configuration							
Active UL BWP		1~4	ULBW	/P.1.1	ULBW	/P.1.1	
configuration							
RLM-RS		1~4	SS	SB	SS	SB	
PDSCH RMC		1~4	SR.3.	SR.3.1 TDD		/A	
configuration							
RMSI CORESET		1~4	CR.3.	CR.3.1 TDD		1 TDD	
RMC							
configuration							
Dedicated		1~4	CCR.3	.1 TDD	CCR.3	.1 TDD	
CORESET RMC							
configuration							
OCNG Patterns		1~4	OF		OF		
TRS configuration		1~4	TRS.2.	1 TDD	N,	/A	
PDSCH/PDCCH		1~4	TCI.S	TCI.State.2		/A	
TCI state							
SSB configuration		1, 2	SSB.1 FR2		SSB.	1 FR2	
		3, 4	SSB.2 FR2		SSB.2	2 FR2	
Propagation		1~4		AV	VGN		
Condition							

Table A.5.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

Parameter	Unit	Config	Ce	Cell 2		II 3		
			T1	T2	T1	T2		
AoA setup		1~4	S	Setup 3 defined in A.3.15.3				
$\hat{E}_{s}/I_{ot}$	dB			TBD	TBD			
$N_{oc}$ Note 2	dBm/15 KHz	1~4		TBD				
Note 2	dBm/SCS	1, 2		TBD				
1 voc		3, 4	TBD					
SS-RSRP	dBm/SCS	1, 2	TBD	TBD	TBD	TBD		
		3, 4	TBD	TBD	TBD	TBD		
$\hat{E}_s/N_{oc}$	dB	1~4	TBD	TBD	TBD	TBD		
Io	dBm/95.04MHz	1~4	TBD TBD			3D		

- Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\rm acc}$  to be fulfilled.
- Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.5.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2 or 3,
- [1.44s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.1.2 EN-DC event triggered reporting test without gap under DRX

#### A.5.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.2.1-1.

Table A.5.6.1.2.1-1: supported test configurations

Configuration	Description				
1	LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
3	LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
4	LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is	Note: The UE is only required to be tested in one of the supported test configurations.				

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.2.1-2 ~ Table A.5.6.1.2.1-6 below.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1~4	E-UTRAN F	Cell (Cell 1)	
		1~4	PSCell (Cel	l 2)	
Neighbour cell		1~4	Cell 3		Cell to be identified.
RF Channel Number			1: Cell 1		One TDD carrier frequency is used for the NR
		1~4	2: Cell 2 and	d Cell 3	cells and one TDD or FDD carrier frequency is
					used for E-UTRAN cell.
SMTC configuration		1~4	SMTC.1		
A3-Offset	dB	1~4	-6		
CP length		1~4	Normal		
Hysteresis	dB	1~4	0		
Time To Trigger	S	1~4	0		
Filter coefficient		1~4	0		L3 filtering is not used
DRX		1~4	DRX.1	DRX.2	DRX related parameters are defined in Table
		1~4			A.5.6.1.2.1-4
Time offset between		1~4	3 μs		Synchronous EN-DC
Cell 1 and Cell 2		1~4			
Time offset between		1~4	3 μs		Synchronous cells
Cell 2 and Cell 3		1~4			
T1	S	1~4	5		
T2	S	1~4	10	52	

Table A.5.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2

TDD configuration	1~4	TDDConf.3.1	TDDConf.3.1
Intial BWP	1~4	DLBWP.0.1	DLBWP.0.1
configuration		ULBWP.0.1	ULBWP.0.1
Active DL BWP	1~4	DLBWP.1.1	DLBWP.1.1
configuration			
Active UL BWP	1~4	ULBWP.1.1	ULBWP.1.1
configuration			
RLM-RS	1~4	SSB	SSB
PDSCH RMC	1~4	SR.3.1 TDD	N/A
configuration			
RMSI CORESET	1~4	CR.3.1 TDD	CR.3.1 TDD
RMC			
configuration			
Dedicated	1~4	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC			
configuration			
OCNG Patterns	1~4	OP.1	OP.1
PDSCH/PDCCH	1~4	TCI.State.2	N/A
TCI state			
TCI state	1~4	CSI-RS.Config.0	N/A
SSB configuration	1, 2	SSB.1 FR2	SSB.1 FR2
	3, 4	SSB.2 FR2	SSB.2 FR2
Propagation	1~4	AV	VGN
Condition			

Table A.5.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

Parameter	Unit	Config	Ce	Cell 2		II 3		
			T1	T2	T1	T2		
AoA setup		1~4	S	Setup 1 defined in A.3.15.1				
$\hat{E}_{s}/I_{ot}$	dB	1~4 4 -1.46		-Infinity	-1.46			
$N_{oc}$ Note 2	dBm/15 KHz	1~4	-98					
$N_{oc}$ Note 2	dBm/SCS	1, 2	-89 -86					
1 oc		3, 4						
SS-RSRP	dBm/SCS	1, 2	-85	-85	-Infinity	-85		
		3, 4	-82	-82	-Infinity	-82		
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	4		
Io	dBm/95.04MHz	1, 2	-54.56	-52.21	-54.56	-52.21		

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.5.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2 or 3,
- [4.32s] for a UE supporting power class 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2 or 3,
- [30.72s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.1.3 EN-DC event triggered reporting test with per-UE gaps under non-DRX

#### A.5.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.3.1-1.

ConfigurationDescription1LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode2LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode3LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode4LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex modeNote:The UE is only required to be tested in one of the supported test configurations.

Table A.5.6.1.3.1-1: supported test configurations

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.3.1-2 ~ 4 below.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Value	Comment
Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)	
Neighbour cell		1~4	Cell 3	Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3	One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
Gap type		1~4	Per-UE gaps	
Measurement gap repitition periodicity	ms	1~4	40	
Measurement gap length	ms	1~4	6	
Measurement gap offset	ms	1~4	39	
SMTC configuration		1~4	SMTC.1	
CSI-RS parameters		1~4	CSI-RS.3.2 TDD	
A3-Offset	dB	1~4	-6	
CP length		1~4	Normal	
Hysteresis	dB	1~4	0	
Time To Trigger	S	1~4	0	
Filter coefficient		1~4	0	L3 filtering is not used
DRX		1~4	OFF	
Time offset between Cell 1 and Cell 2		1~4	3 μs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3 μs	Synchronous cells
T1	s	1~4	5	
T2	S	1~4	5	

Table A.5.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2

TDD configuration	1~4	TDDConf.3.1	TDDConf.3.1
Intial BWP	1~4	DLBWP.0.1	DLBWP.0.1
configuration		ULBWP.0.1	ULBWP.0.1
Active DL BWP	1~4	DLBWP.1.2	DLBWP.1.1
configuration			
Active UL BWP	1~4	ULBWP.1.2	ULBWP.1.1
configuration			
RLM-RS	1~4	CSI-RS	SSB
PDSCH RMC	1~4	SR.3.1 TDD	N/A
configuration			
RMSI CORESET	1~4	CR.3.1 TDD	CR.3.1 TDD
RMC			
configuration			
Dedicated	1~4	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC			
configuration			
TRS configuration	1~4	TRS.2.1 TDD	N/A
PDSCH/PDCCH	1~4	TCI.State.2	N/A
TCI state			
OCNG Patterns	1~4	OP.1	OP.1
SSB	1, 2	SSB.1 FR2	SSB.1 FR2
	3, 4	SSB.2 FR2	SSB.2 FR2
Propagation	1~4	AV	VGN
Condition			

Table A.5.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 2		Cell 3		
			T1	T2	T1	T2	
AoA setup		1~4	Setup 3 defined in A.3.15.3				
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	dB 1~4 TBD TBD		TBD	TBD		
$N_{oc}$ Note 2	dBm/15 KHz	1~4	TBD				
$N_{oc}$ Note 2	dBm/SCS	1, 2	TBD TBD				
1 voc		3, 4					
SS-RSRP	dBm/SCS	1, 2	TBD	TBD	TBD	TBD	
		<u>3, 4</u>	TBD	TBD	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	3, 4	TBD	TBD	TBD	TBD	
Io	dBm/95.04MHz	1~4	TBD TBD			3D	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.5.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 1.92s for a UE supporting power class 2 or 3,
- [1.92s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.1.4 EN-DC event triggered reporting test with per-UE gaps under DRX

#### A.5.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.4.1-1.

Table A.5.6.1.4.1-1: supported test configurations

Configuration	Description			
1	LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2	LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
3	LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
4	LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to be tested in one of the supported test configurations.				

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.4.1-2 ~ 6.

During the test, Cell 2 and Cell 3 are transmitted from the direction determined according to A3.8.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Value				Comment
			Test 1	Test 2			

Active cell		1~4	E-UTRAN I PSCell (Ce	PCell (Cell 1) Il 2)	
Neighbour cell		1~4	Cell 3		Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3		One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
Gap type		1~4	Per-UE gap	os	
Measurement gap repitition periodicity	ms	1~4	40		
Measurement gap length	ms	1~4	6		
Measurement gap offset	ms	1~4	39		
SMTC configuration		1~4	SMTC.1		
CSI-RS parameters		1~4	CSI-RS.3.2	TDD	
A3-Offset	dB	1~4	-6		
CP length		1~4	Normal		
Hysteresis	dB	1~4	0		
Time To Trigger	s	1~4	0		
Filter coefficient		1~4	0		L3 filtering is not used
DRX		1~4	DRX.1	DRX.2	DRX related parameters are defined in Table A.5.6.1.4.1-5
Time offset between Cell 1 and Cell 2		1~4	3 μs		Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3 μs		Synchronous cells
T1	S	1~4	5		
T2	S	1~4	10	52	

Table A.5.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Cell	Cell 2		II 3
			T1	T1 T2		T2
TDD configuration		1~4	TDDCor	f.3.1	TDDC	onf.3.1
Intial BWP		1~4	DLBWF	2.0.1	DLBW	/P.0.1
configuration			ULBWF	2.0.1	ULBW	/P.0.1
Active DL BWP		1~4	DLBWF	2.1.2	DLBW	/P.1.1
configuration						
Active UL BWP		1~4	ULBWF	2.1.2	ULBW	/P.1.1
configuration						
RLM-RS		1~4	CSI-F	RS	SS	SB
PDSCH RMC		1~4	SR.3.1	TDD	N/	/Α
configuration						
RMSI CORESET		1~4	CR.3.1	TDD	CR.3.	1 TDD
RMC						
configuration						
Dedicated		1~4	CCR.3.1	TDD	CCR.3	.1 TDD
CORESET RMC						
configuration						
TRS configuration		1~4	TRS.2.1	TDD	N,	/A
PDSCH/PDCCH	·	1~4	TCI.Sta	TCI.State.2		/A
TCI state						
OCNG Patterns		1~4	OP.	OP.1		2.1
SSB		1, 2	SSB.1	FR2	SSB.	l FR2
		3, 4	SSB.2	FR2	SSB.2	2 FR2

Propagation	1~4	AWGN
Condition		

Table A.5.6.1.4.1-4: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Ce	II 2	Cell 3			
			T1	T2	T1	T2		
AoA setup		1~4	S	etup 1 defii	ned in A.3.1	5.1		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1~4	4	-1.46	-Infinity	-1.46		
$N_{oc}$ Note 2	dBm/15 KHz	1~4		-98				
Note 2	dBm/SCS	1, 2	-89					
1 oc		3, 4		-86				
SS-RSRP	dBm/SCS	1, 2	-85	-85	-Infinity	-85		
		3, 4	-82	-82	-Infinity	-82		
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	4		
Io	dBm/95.04MHz	1, 2	-54.56	-52.21	-54.56	-52.21		

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.5.6.1.4.1-5: Void

Table A.5.6.1.4.1-6: Void

### A.5.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2 or 3,
- [4.32s] for a UE supporting power class 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.20s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2 or 3,
- [30.72s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.2 Inter-frequency Measurements

# A.5.6.2.1 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

### A.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.1.1-1, A.5.6.2.1.1-2, and A.5.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.1.1-1.

Table A.5.6.2.1.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2

	Config	Description	
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations	
Note 2:	target NR cell ha	is the same SCS, BW and duplex mode as NR serving cell	

Table A.5.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Va	lue	Comment				
		configurati on	Test 1	Test 2					
E-UTRA RF Channel Number		Config 1,2	1		One E-UTRAN TDD carrier frequencies is used.				
NR RF Channel Number		Config 1,2	1,	, 2	Two FR1 NR carrier frequencies is used.				
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)						LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.				
Gap Pattern Id		Config 1,2	0	13	As specified in clause 9.1.2-1.				
Measurement gap offset		Config 1,2	39 39						
SMTC-SSB parameters		Config 1,2	SSB.1 FR2		As specified in clause A.3.10.2				
A3-Offset	dB	Config 1,2	-6						
Hysteresis	dB	Config 1,2	0						
CP length		Config 1,2	Normal						
TimeToTrigger	S	Config 1,2	0						
Filter coefficient		Config 1,2	0		L3 filtering is not used				
DRX		Config 1,2	OFF		DRX is not used				
Time offset between PCell and PSCell		Config 1,2	3 μs		Synchronous EN-DC				
Time offset between serving and neighbour cells		Config 1,2	3μs		Synchronous cells.				
T1	s	Config 1,2	5						
T2	S	Config 1,2	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC					

Table A.5.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2		C	ell 3
		configuratio	T1	T2	T1	T2
		n				
NR RF Channel Number		Config 1,2		1		2
Duplex mode		Config 1,2	TI	DD		ΓDD
BW <sub>channel</sub>	MHz	Config 1,2	100: N	RB,c = 66	100: N <sub>RB,c</sub> = 66	
BWP BW	MHz	Config 1,2	100: N	100: N <sub>RB.c</sub> = 66		$N_{RB,c} = 66$
TDD configuration		Config 1,2	TDDC	TDDConf.3.1		Conf.3.1
Initial DL BWP		Config 1,2	DLBV	VP.0.1	NA	
Initial UL BWP		Config 1,2	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBV	VP.1.1	NA	

Dedicated UL BWP		Config 1,2	ULBV	VP.1.1		NA	
OCNG Patterns defined in		Config 1,2	OP.1		C	)P.1	
A.3.2.1.1 (OP.1)				. ====			
TRS configuration		Config 1,2	TRS.2.1 TDD		NA		
TCI configuration		Config 1,2	CSI-RS.	Config.0		NA	
PDSCH Reference measurement channel		Config 1,2	SR.3.	1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.	1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,2	SM	TC.1	SM	ITC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	12	20	,	120	
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS					0		
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2	(	0			
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis	degrees	Config 1,2		IA		BD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	N	IA	NA	TBD	
$N_{oc}^{ m Note2}$	dBm/15 kHz Note5		TE	BD	Т	BD	
$N_{oc}^{ m Note2}$	dBm/S CS Note4	Config 1,2	TE	BD	Т	BD	
SS-RSRP Note 3	dBm/S CS Note5	Config 1,2	TBD	TBD	TBD	TBD	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	Config 1,2	TBD	TBD	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD	
IoNote3	dBm/95 .04 MHz Note5	Config 1,2	TBD	TBD	TBD	TBD	
Propagation Condition		Config 1,2		A۱	WGN		

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be
	fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6:	As observed with 0dBi gain antenna at the centre of the guiet zone

#### A.5.6.2.1.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.5.6.2.2 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

#### A.5.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.2.1-1, A.5.6.2.2.1-2, and A.5.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration #0 as defined in Table A.5.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.2.1-1.

Table A.5.6.2.2.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2

	Config	Description
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations
Note 2:	target NR cell ha	s the same SCS, BW and duplex mode as NR serving cell

Table A.5.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test		Value			Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2			1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2		1,	2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.1	FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Norma	al			
TimeToTrigger	S	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs				Synchronous cells.
T1	S	Config 1,2	5				
T2	S	Config 1,2	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.5.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3		
		configuratio	T1	T2	T1	T2	
		n					

NR RF Channel Number		Config 1,2	1	2	2
Duplex mode		Config 1,2	TDD	Т	DD .
BWchannel	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66		RB,c = 66
BWP BW	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66		RB,c = 66
TDD configuration		Config 1,2	TDDConf.3.1		onf.3.1
Initial DL BWP		Config 1,2	DLBWP.0.1	N	Α
Initial UL BWP		Config 1,2	ULBWP.0.1		
Dedicated DL BWP		Config 1,2	DLBWP.1.1	N	Α
Dedicated UL BWP		Config 1,2	ULBWP.1.1	N	Α
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OP.1	OF	P.1
TRS configuration		Config 1,2	TRS.2.1 TDD	N	Α
TCI configuration		Config 1,2	CSI-RS.Config.0	N	A
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-
CORESET Reference Channel		Config 1,2	CR.3.1 TDD	-	
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SMTC.1	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120	120	
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS		Config 1,2	0	0	
EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)					
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	NA	TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	NA	NA	TBD
$N_{oc}^{$	dBm/15 kHz Note5		TBD	TE	BD
$N_{oc}^{ m Note2}$	dBm/S CS Note4	Config 1,2	TBD	TE	BD

SS-RSRP Note 3	dBm/S	Config 1,2	TBD	TBD	TBD	TBD	
	CS						
	Note5						
$\hat{ extbf{E}}_{ ext{s}}/ extbf{I}_{ ext{ot}}$	dB	Config 1,2	TBD	TBD	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD	
Io <sup>Note3</sup>	dBm/95	Config 1,2	TBD	TBD	TBD	TBD	
	.04						
	MHz						
	Note5						
Propagation Condition		Config 1,2	AWGN				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.5.6.2.2.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.3 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

#### A.5.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.3.1-1, A.5.6.2.3.1-2, and A.5.6.2.3.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.3.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.3.1-1 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.3.1-1.

Table A.5.6.2.3.1-1 EN-DC event triggered reporting tests with SSB index reading for FR2-FR2

	Config	Description
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations
Note 2:	target NR cell ha	is the same SCS, BW and duplex mode as NR serving cell

Table A.5.6.2.3.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value		Comment				
		configurati	Test 1	Test 2					
		on							
E-UTRA RF Channel		Config 1,2	1		One E-UTRAN TDD carrier				
Number					frequencies is used.				
NR RF Channel Number		Config 1,2	1,	, 2	Two FR1 NR carrier frequencies is used.				
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)						LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.				
Gap Pattern Id		Config 1,2	0 13		0 13		As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1,2	39 39						
SMTC-SSB parameters		Config 1,2	SSB.1 FR2		As specified in clause A.3.10.2				
A3-Offset	dB	Config 1,2	-6						
Hysteresis	dB	Config 1,2	0						
CP length		Config 1,2	Normal						
TimeToTrigger	S	Config 1,2	0						
Filter coefficient		Config 1,2	0		L3 filtering is not used				
DRX		Config 1,2	OFF		DRX is not used				
Time offset between PCell and PSCell		Config 1,2	3 μs		Synchronous EN-DC				
Time offset between serving and neighbour cells		Config 1,2	3μs		Synchronous cells.				
T1	S	Config 1,2	5						
T2	S	Config 1,2	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC					

Table A.5.6.2.3.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3	
		configuratio n	T1	T2	T1	T2
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TE	D	7	TDD
BW <sub>channel</sub>	MHz	Config 1,2	100: N <sub>F</sub>	$_{B,c} = 66$	100: N	$N_{RB,c} = 66$
BWP BW	MHz	Config 1,2	100: N <sub>F</sub>			$N_{RB,c} = 66$
TDD configuration		Config 1,2	TDDC	onf.3.1	TDD	Conf.3.1
Initial DL BWP		Config 1,2	DLBW	/P.0.1		NA
Initial UL BWP		Config 1,2	DLBW	/P.0.1		
Dedicated DL BWP		Config 1,2	DLBW	/P.1.1		NA
Dedicated UL BWP		Config 1,2	ULBW	/P.1.1		NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OF	P.1	C	)P.1
PDSCH Reference measurement channel		Config 1,2	SR.3.	1 TDD		-
CORESET Reference Channel		Config 1,2	CR.3.			-
TRS configuration		Config 1,2	TRS.2.1 TDD		NA	
TCI configuration		Config 1,2	CSI-RS.Config.0		NA	
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SMT	⁻C.1	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	12	20	120	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2	(	)		0
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	N		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	NA		NA	TBD

$N_{oc}$ Note2	dBm/15 kHz		TBD		TBD		
$N_{oc}$ Note2	Note5 dBm/S CS Note4	Config 1,2	TBD		TBD		
SS-RSRP Note 3	dBm/S CS Note5	Config 1,2	TBD	TBD	TBD	TBD	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2	TBD	TBD	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD	
Io <sup>Note3</sup>	dBm/95 .04 MHz Note5	Config 1,2	TBD	TBD	TBD	TBD	
Propagation Condition		Config 1,2		AWGN			

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

#### A.5.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.4 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

#### A.5.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.4.1-1, A.5.6.2.4.1-2, and A.5.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.4.1-1.

Table A.5.6.2.4.1-1: EN-DC event triggered reporting tests with SSB index reading for FR2-FR2

	Config	Description					
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
Note 1:	lote 1: The UE is only required to be tested in one of the supported test configurations						
Note 2:	target NR cell ha	s the same SCS, BW and duplex mode as NR serving cell					

Table A.5.6.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test		Value			Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
E-UTRA RF Channel		Config 1,2		•	1		One E-UTRAN TDD carrier
Number		0 " 10					frequencies is used.
NR RF Channel Number		Config 1,2		1,	2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.1	FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Norma	al			
TimeToTrigger	S	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	Зµѕ				Synchronous cells.
T1	S	Config 1,2	5				
T2	S	Config 1,2	for PC1; 6.5 for othe r PC	108 for PC1; 67 for othe r PC	for PC1; 6.5 for othe r PC	for PC1; 67 for other PC	

Table A.5.6.2.4.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 2 C	
		configuratio	T1	T2	T1	T2
		n				
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
BW <sub>channel</sub>	MHz	Config 1,2	100: N	$I_{RB,c} = 66$	100: N <sub>RB,c</sub> = 66	
BWP BW	MHz	Config 1,2	100: N	$I_{RB,c} = 66$	100: N <sub>RB,c</sub> = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLB	WP.0.1	ı	NA

Initial UL BWP		Config 1,2	ULBV	VP.0.1		
Dedicated DL BWP		Config 1,2	DLBWP.1.1			NA
Dedicated UL BWP		Config 1,2	ULBWP.1.1 NA		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OF	P.1	C	)P.1
PDSCH Reference measurement channel		Config 1,2	SR.3.	1 TDD		-
CORESET Reference Channel		Config 1,2	CR.3.	1 TDD		-
TRS configuration		Config 1,2	TRS.2	.1 TDD		NA
TCI configuration		Config 1,2	CSI-RS.	Config.0		NA
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1,2	SM	ΓC.1	SN	/ITC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	1:	20		120
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)		Config 1,2	0			0
UE orientation around TBD axis and TBD axis	degrees	Config 1,2	N	IA	٦	ΓBD
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2	N	IA	NA	TBD
$N_{oc}^{\text{Note2}}$	dBm/15 kHz Note5		TBD		TBD	
$N_{oc}^{}$ Note2	dBm/S CS Note4	Config 1,2	TBD		٦	ΓBD
SS-RSRP Note 3	dBm/S CS Note5	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2	TBD	TBD	TBD	TBD

Io <sup>Note3</sup>		dBm/95	Config 1,2	TBD	TBD	TBD	TBD		
		.04	_						
		MHz							
		Note5							
Propagat	ion Condition		Config 1,2		A۱	WGN			
Note 1:	OCNG shall be used spectral density is ac	hieved for	all OFDM symbo	ols.					
Note 2:	Interference from oth	er cells and	d noise sources	not specified	in the test is	s assumed to	be constant		
	over subcarriers and	time and s	hall be modelled	l as AWGN o	of appropriate	e power for I	$N_{oc}$ to be		
Note 3:	fulfilled.  Iote 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								
Note 4:									
Note 5: Note 6:	5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone					ie			

### A.5.6.2.2.4 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.5 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

#### A.5.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.5.1-1, A.5.6.2.5.1-2, and A.5.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.5.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.5.1-1.

Table A.5.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,					
	duplex mode	100 MHz bandwidth, TDD					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode					
	duplex mode						
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD						
	duplex mode						
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD						
	duplex mode						
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD						
	duplex mode						
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD						
	duplex mode						
Note: The UI	Note: The UE is only required to be tested in one of the supported test configurations						

Table A.5.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6		1	One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1,	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (Pocell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	S	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs		Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5		
T2	S	Config 1,2,3,4,5,6	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC	

Table A.5.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test		ell 2	Cell 3	
		configuratio	T1	T1 T2		T2
NR RF Channel Number		n Config		<u> </u> 1		2
NR RF Channel Number		1,2,3,4,5,6		1	2	
Duplex mode		Config 1,4	FDD		TDD	
Duplex mode		Config		DD DD		TDD
		2,3,5,6	• •			100
BWchannel	MHz	Config 1,4	10: N <sub>F</sub>	RB,c = 52	100:	N <sub>RB,c</sub> = 66
		Config 2,5		RB,c = 52		$N_{RB,c} = 66$
		Config 3,6		B,c = 106		N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 1,4	10: N <sub>F</sub>	RB,c = 52	100:	N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>F</sub>	RB,c = 52	100:	$N_{RB,c} = 66$
		Config 3,6	40: N <sub>R</sub> i	B,c = 106	100:	N <sub>RB,c</sub> = 66
TDD configuration		Config 2,5	TDDC	Conf.1.1	TDD	Conf.3.1
		Config 3,6	TDDC	Conf.2.1	TDD	Conf.3.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBV	VP.0.1		NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBV	VP.0.1		NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		(	OP.1
PDSCH Reference		Config 1,4	SR 1	.1 FDD		-
measurement channel		Config 2,5		.1 TDD	_	
		Config 2,5		1 TDD	4	
CORESET Reference		Config 3,6		.1 FDD		
Channel		Config 1,4		.1 TDD .1 TDD	1	-
Charine		Config 2,5		1 TDD	_	
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4		TC.2	SI	MTC.2
		Config 2,3,5,6	SM	TC.1	SI	MTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	,	15		120
. 3		Config 3,6		30		120
EPRE ratio of PSS to SSS			·			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS		1				
EPRE ratio of PDCCH DMRS to SSS		Config	0			0
EPRE ratio of PDCCH to PDCCH DMRS		1,2,3,4,5,6				
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						

EPRE ratio of OCNG DMRS						
to SSS(Note 1)						
EPRE ratio of OCNG to						
OCNG DMRS (Note 1)						
UE orientation around TBD	-1	Config	N	IA	Т	BD
axis and TBD axis	degrees	1,2,3,4,5,6				
Relative difference in angle of		Config	Ν	IA	NA	TBD
arrival of cell 3 relative to cell	degrees	1,2,3,4,5,6				
2						
$N_{oc}^{ m Note2}$	dBm/15		N	IA	Т	BD
1 oc	kHz					
	Note5					
$N_{oc}^{}$ Note2	dBm/S	Config	N	IA	Т	BD
- ' oc	CS	1,2,4,5				
	Note4	Config 3,6		IA		BD
SS-RSRP Note 3	dBm/S	Config	NA	NA	-Infinity	TBD
	CS	1,2,4,5				
	Note5	Config 3,6	NA	NA	-Infinity	TBD
$\hat{E}_{s}/I_{ot}$	dB	Config	NA	NA	-Infinity	TBD
		1,2,3,4,5,6				
$\hat{E}_s/N_{oc}$	dB	Config	NA	NA	-Infinity	TBD
		1,2,3,4,5,6				
Io <sup>Note3</sup>	dBm/9.	Config	NA	NA	-	-
	36MHz	1,2,4,5				
	dBm/38	Config 3,6	NA	NA	-	-
	.16MHz					
	dBm/95	Config	-	-	-Infinity	TBD
	.04	1,2,3,4,5,6				
	MHz					
	Note5	_				
Propagation Condition		Config		AV	VGN	
	<u> </u>	1,2,3,4,5,6				
Note 1: OCNG shall be used	such that b	oth cells are full	v allocated a	ind a constar	nt total transn	nitted power

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

### A.5.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.6 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

### A.5.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.6.1-1, A.5.6.2.6.1-2, and A.5.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.6.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.6.1-1.

Table A.5.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,
	duplex mode	100 MHz bandwidth, TDD
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode
	duplex mode	
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	
	duplex mode	
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	
	duplex mode	
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
Note: The U	E is only required to be tested in one of the supported test configura	tions

Table A.5.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Value				Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies is used.

Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2,3,4,5,6	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1				As specified in clause A.3.10.1
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3,6	SSB.2	FR1			As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1	FR2			As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD				
CP length		Config 1,2,3,4,5,6	Norma	al			
TimeToTrigger	S	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX		Config 1,2,3,4,5,6	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs				Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5				
T2	S	Config 1,2,3,4,5,6	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.5.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3	
		configuratio	T1 T2		T1	T2
		n				
NR RF Channel Number		Config	•	1		2
		1,2,3,4,5,6				
Duplex mode		Config 1,4	F	)D	TDD	

	I	0	TDD	1 -	TDD.
		Config 2,3,5,6	TDD		DD
BW <sub>channel</sub>	MHz	2,3,5,6 Config 1,4	10: N <sub>RB,c</sub> = 52	100: N	$N_{RB,c} = 66$
DVV channel	IVITZ	Config 1,4	10: N <sub>RB,c</sub> = 52		$N_{RB,c} = 60$ $N_{RB,c} = 66$
		Config 3,6	40: N <sub>RB,c</sub> = 106		$N_{RB,c} = 66$
BWP BW	MHz	Config 1,4	10: N <sub>RB,c</sub> = 100		$N_{RB,c} = 66$
BVVI BVV	1011 12	Config 2,5	10: N <sub>RB,c</sub> = 52		$V_{RB,c} = 66$
		Config 3,6	40: N <sub>RB,c</sub> = 106		$N_{RB,c} = 66$
TDD configuration			TDDConf.1.1		Conf.3.1
. 2 2 coga.ac		Config 2,5			
		Confin 2.0	TDDConf.2.1	TDD	Conf.3.1
		Config 3,6			
Initial DL BWP		Config	DLBWP.0.1		NA
		1,2,3,4,5,6			
Initial UL BWP		Config	ULBWP.0.1		NA
		1,2,3,4,5,6			
Dedicated DL BWP		Config	DLBWP.1.1		NA
		1,2,3,4,5,6			
Dedicated UL BWP		Config	ULBWP.1.1		NA
		1,2,3,4,5,6			
OCNG Patterns defined in		Config	OP.1		)P.1
A.3.2.1.1 (OP.1)		1,2,3,4,5,6			
PDSCH Reference		Config 1,4	SR.1.1 FDD		-
measurement channel		Config 2,5	SR.1.1 TDD		
		Config 3,6	SR2.1 TDD		
CORESET Reference		Config 1,4	CR.1.1 FDD		_
Channel		Config 2,5	CR.1.1 TDD		
		Config 3,6	CR2.1 TDD		
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2	SN	/ITC.2
		Config 2,3,5,6	SMTC.1	SN	/ITC.1
PDSCH/PDCCH subcarrier	kHz	Config	15		120
spacing		1,2,4,5	15		120
		Config 3,6	30	,	120
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS					
to SSS					
EPRE ratio of PBCH to PBCH					
DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to		Config	0		0
PDCCH DMRS		1,2,3,4,5,6	0		J
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to					
PDSCH					
EPRE ratio of OCNG DMRS					
to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
UE orientation around TBD	de a	Config	NA	7	ГВD
axis and TBD axis	degrees	1,2,3,4,5,6			
Relative difference in angle of		Config	NA	NA	TBD
arrival of cell 3 relative to cell	degrees	1,2,3,4,5,6			
2					

$N_{oc}^{ m Note2}$	dBm/15 kHz Note5		N	IA	٦	ГBD
N <sub>oc</sub> Note2	dBm/S CS	Config 1,2,4,5	N	NA		ΓBD
	Note4	Config 3,6	N	IA	٦	ΓBD
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	NA	NA	TBD	TBD
	Note5	Config 3,6	NA	NA	TBD	TBD
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5	NA	NA	-	-
	dBm/38 .16MHz	Config 3,6	NA	NA	-	-
	dBm/95 .04 MHz Note5	Config 1,2,3,4,5,6	-	-	TBD	TBD
Propagation Condition		Config 1,2,3,4,5,6		A'	WGN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.5.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.7 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

#### A.5.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.7.1-1, A.5.6.2.7.1-2, and A.5.6.2.7.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.7.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.7.1-1.

Table A.5.6.2.7.1-1: EN-DC event triggered reporting tests with SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,					
	duplex mode	100 MHz bandwidth, TDD					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode					
	duplex mode						
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD						
	duplex mode						
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD						
	duplex mode						
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD						
	duplex mode						
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD						
	duplex mode						
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations						

Table A.5.6.2.7.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
E-UTRA RF Channel		Config		1	One E-UTRAN TDD carrier
Number NR RF Channel		1,2,3,4,5,6 Config	4	2	frequencies is used.
Number Number		1,2,3,4,5,6	1,	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (Pocell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs		Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5		
T2	S	Config 1,2,3,4,5,6	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC	

Table A.5.6.2.7.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2	Cell 3
		configuratio n	T1 T2	T1 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1	2
Duplex mode		Config 1,4	FDD	TDD
·		Config	TDD	TDD
		2,3,5,6		
BW <sub>channel</sub>	MHz	Config 1,4	10: $N_{RB,c} = 52$	100: N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
BVVP BVV	IVI□Z	Config 1,4 Config 2,5	10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66 100: N <sub>RB,c</sub> = 66
		Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
OCNG Patterns defined in		Config	OP.1	OP.1
A.3.2.1.1 (OP.1)		1,2,3,4,5,6		<b>5</b>
PDSCH Reference		Config 1,4	SR.1.1 FDD	
measurement channel		Config 2,5	SR.1.1 TDD	
		Config 3,6	SR2.1 TDD	
CORESET Reference		Config 1,4	CR.1.1 FDD	-
Channel		Config 2,5	CR.1.1 TDD	
TDD configuration		Config 3,6	CR2.1 TDD	TDDConf.3.1
TDD configuration		Config 2,5	TDDConf.1.1	
		Config 3,6	TDDConf.2.1	TDDConf.3.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1	NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1	NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1	NA
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2	SMTC.2
		Config 2,3,5,6	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15	120
		Config 3,6	30	120
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS		Config 1,2,3,4,5,6	0	0
EPRE ratio of PDCCH to PDCCH DMRS		1,2,3,4,3,0		
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				

EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3,4,5,6		IA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3,4,5,6	N	IA	NA	TBD	
$N_{oc}^{ m Note2}$	dBm/15 kHz Note5		Ν	IA	Ť	TBD	
$N_{oc}^{ m Note2}$	dBm/S CS	Config 1,2,4,5	NA		Т	TBD	
	Note4	Config 3,6	N	IA		TBD	
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	NA	NA	-Infinity	TBD	
	Note5	Config 3,6	NA	NA	-Infinity	TBD	
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	-Infinity	TBD	
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	-Infinity	TBD	
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5	NA	NA	-	-	
	dBm/38 .16MHz	Config 3,6	NA	NA	-	-	
	dBm/95 .04 MHz Note5	Config 1,2,3,4,5,6	-	-	-Infinity	TBD	
Propagation Condition		Config 1,2,3,4,5,6	AWGN				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant					•		
			· ·				
over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be							

fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

As observed with 0dBi gain antenna at the centre of the quiet zone Note 6:

#### A.5.6.2.7.2 **Test Requirements**

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.8 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

#### A.5.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.8.1-1, A.5.6.2.8.1-2, and A.5.6.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.8.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.8.1-1.

Table A.5.6.2.8.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,
	duplex mode	100 MHz bandwidth, TDD
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode
	duplex mode	
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	
	duplex mode	
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	
	duplex mode	
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
Note: The U	E is only required to be tested in one of the supported test configurat	tions

Table A.5.6.2.8.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value			Comment	
		configurati	Test	Test	Test	Test	
E LITDA DE Obrasia		on	1	2	3	4	On a F LITDAN TOD assista
E-UTRA RF Channel Number		Config 1,2,3,4,5,6			1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel		Config		1.	, 2		Two FR1 NR carrier frequencies is
Number		1,2,3,4,5,6		- 1	, –		used.
Active cell		Config		ell 1 (PC		d NR	LTE Cell 1 is on E-UTRA RF
		1,2,3,4,5,6	ceii 2	(PScell)			channel number 1.  NR Cell 2 is on NR RF channel
							number 1.
Neighbour cell		Config	NR ce	II 3			NR cell 3 is on NR RF channel
		1,2,3,4,5,6					number 2.
Gap Pattern Id		Config	0		13		As specified in clause 9.1.2-1.
Measurement gap		1,2,3,4,5,6 Config	39		39		
offset		1,2,3,4,5,6	33		33		
SMTC-SSB parameters		Config 1,4	SSB.1	FR1			As specified in clause A.3.10.1
on NR RF Channel 1		_					
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3,6	SSB.2	FR1			As specified in clause A.3.10.1
		Coming 5,0	000.2	. 1 1 1 1			As specified in clause A.s. To. 1
SMTC-SSB parameters		Config	SSB.1	FR2			As specified in clause A.3.10.2
on NR RF Channel 2		1,2,3,4,5,6					
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config	0				
.,,		1,2,3,4,5,6					
a4-Threshold	dBm	Config	TBD				
CP length		1,2,3,4,5,6 Config	Norma	-1			
CP length		1,2,3,4,5,6	NOTTI	al .			
TimeToTrigger	s	Config	0				
		1,2,3,4,5,6					
Filter coefficient		Config	0				L3 filtering is not used
DRX		1,2,3,4,5,6 Config	DRX	DRX	DRX	DRX	As specified in clause A.3.3
DIXX		1,2,3,4,5,6	.1	.2	.1	.2	As specified in clause A.S.S
Time offset between		Config	3 μs			· I	Synchronous EN-DC
PCell and PSCell		1,2,3,4,5,6					
Time offset between		Config 1,4	3ms				Asynchronous cells.
serving and neighbour cells							The timing of Cell 3 is 3ms later than the timing of Cell 2.
CONO		Config	3μs				Synchronous cells.
		2,3,5,6					
T1	S	Config	5				
	3	1,2,3,4,5,6					
T2	S	Config	11 for	108	11 for	108	
		1,2,3,4,5,6	for PC1;	for PC1;	for PC1;	for PC1;	
			6.5	67	6.5	67	
			for	for	for	for	
			othe	othe	othe	other	
			r PC	r PC	r PC	PC	

Table A.5.6.2.8.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2	Cell 3
		configuratio n	T1 T2	T1 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1	2
Duplex mode		Config 1,4	FDD	TDD
·		Config	TDD	TDD
		2,3,5,6		
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
BVVP BVV	IVI□Z	Config 1,4 Config 2,5	10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66 100: N <sub>RB,c</sub> = 66
		Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
OCNG Patterns defined in		Config	OP.1	OP.1
A.3.2.1.1 (OP.1)		1,2,3,4,5,6		0
PDSCH Reference		Config 1,4	SR.1.1 FDD	-
measurement channel		Config 2,5	SR.1.1 TDD	
		Config 3,6	SR2.1 TDD	
CORESET Reference		Config 1,4	CR.1.1 FDD	-
Channel		Config 2,5	CR.1.1 TDD	
TDD configuration		Config 3,6	CR2.1 TDD	TDDConf.3.1
TDD configuration		Config 2,5	TDDConf.1.1	
		Config 3,6	TDDConf.2.1	TDDConf.3.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1	NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1	NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1	NA
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1,4	SMTC.2	SMTC.2
		Config 2,3,5,6	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15	120
		Config 3,6	30	120
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS		]		
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS		Config 1,2,3,4,5,6	0	0
EPRE ratio of PDCCH to PDCCH DMRS		1,2,0,4,0,0		
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				

EPRE ratio of OCNG DMRS

to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3,4,5,6	N	NA		TBD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3,4,5,6	N	A	NA	TBD	
$N_{oc}$ Note2	dBm/15 kHz Note5		N	A		TBD	
$N_{\it oc}$ Note2	dBm/S CS	Config 1,2,4,5		A		TBD	
	Note4	Config 3,6	N	A	Т	TBD	
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	NA	NA	TBD	TBD	
	Note5	Config 3,6	NA	NA	TBD	TBD	
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	NA	NA	TBD	TBD	
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5	NA	NA	-	-	
	dBm/38 .16MHz	Config 3,6	NA	NA	-	-	
	dBm/95 .04 MHz Note5	Config 1,2,3,4,5,6	-	1	TBD	TBD	
Propagation Condition		Config 1,2,3,4,5,6	AWGN				
Note 1: OCNG shall be used spectral density is at Note 2: Interference from other controls.	chieved for a	all OFDM symbo	ls.			·	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

### A.5.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.3 L1-RSRP measurement for beam reporting

### A.5.6.3.1 SSB based L1-RSRP measurement when DRX is not used

#### A.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in section A.3.15

Table A.5.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

Config	Description				
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only re	e UE is only required to be tested in one of the supported test configurations				

#### A.5.6.3.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.1.2-1 and Table A.5.6.3.1.2-2 below.

In CSI measurement configuratation, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.5.6.3.1.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
BW <sub>channel</sub>	1~4	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD
SSB configuration	1,2		SSB.1 FR2
	3,4		SSB.2 FR2
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~4		SMTC.1
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2
DRX configuration	1~4		Off
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	640
T1	1~4	S	5
T2	1~4	S	1
Propagation condition	1~4		AWGN
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDCCH DMRS to SSS	1~4	dB	0
EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN

Table A.5.6.3.1.2-2: SSB specific test parameters

Parameter	Config	Unit	SS	B#0	SSI	3#1
Parameter	Coming	Offic	T1	T2	T1	T2
$N_{oc}^{ m Note2}$	1~4	dBm/15kHz	TBD			
N <sub>a Note2</sub> 1,2 dBm/SSB SCS		TE	3D			
TV <sub>oc</sub>	3,4	UBIII/33B 3C3	TBD			
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$	1~4	dB	TBD	TBD	-Infinity	TBD
SSB RSRP Note3	1,2	dBm/SSB SCS	TBD	TBD	-Infinity	TBD
COD NON	3,4	GDIII/ COD COC	TBD	TBD	-Infinity	TBD

lo Note3	1,2	dBm/95.04MHz –	TBD	TBD	TBD	TBD
10	3,4		TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	1~4	dB	TBD	TBD	-Infinity	TBD

#### A.5.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 640 slots. After 480ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of [0-17] dB.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.3.2 SSB based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.5.6.3.1.

#### A.5.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

#### A.5.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.3.1-1.

Table A.5.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

Config	Description
1	LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only	required to be tested in one of the supported test configurations

### A.5.6.3.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.3.2-1 and Table A.5.6.3.3.2-2 below.

In CSI measurement configuratation, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of two successive time periods, with time duration of T1, and T2 respectively. At 20ms from the beginning of T2, UE is triggered to measure on the aperiodic CSI-RS resource set containing two resources, and to report based on the reporting configuration in Table A.5.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.5.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		Off
reportConfigType	1~2		aperiodic
reportQuantity	1~2		cri-RSRP
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		TBD
Propagation condition	1~2		AWGN
T1	1~2	S	5
T2	1~2	S	1
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1	1~2	dB	0
EPRE ratio of OCNG to OCNG DMRS Note 1			

SSB#0 SSB#1 **Parameter** Config Unit T1 **T2** T1 **T2**  $N_{ac}$  Note2 1~2 dBm/15kHz **TBD**  $N_{oc}$  Note2 1~2 dBm/SSB SCS **TBD** 1~2 dB **TBD TBD** -Infinity **TBD** CSI-RS RSRP 1~2 dBm/SSB SCS **TBD** TBD TBD -Infinity Note3 In Note3 1~2 dBm/95.04MHz **TBD TBD TBD TBD**  $\hat{E}_{c}/N_{oc}$ 1~2 dB **TBD TBD** -Infinity **TBD** 

Table A.5.6.3.3.2-1: CSI-RS specific test parameters

### A.5.6.3.3.3 Test Requirements

The UE shall send L1-RSRP report at slot [TBD] from the beginning of T2. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of [0-17] dB.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.5.6.3.3.

## A.5.7 Measurement Performance requirements

## A.5.7.1 SS-RSRP

# A.5.7.1.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

### A.5.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 10.1.2.1.1 and 10.1.2.1.1 for intra-frequency measurements.

### A.5.7.1.1.2 Test parameters

In this set of test cases all NR cells are on the same carrier frequency. Supported test configurations are shown in table A.5.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra frequency measurements are tested by using the parameters in Table A.5.7.1.1.2-2 and A.5.7.1.1.2-3. The E-UTRA PCell is configured as specified in section A.3.7.2.2. In all test cases, Cell 1 is the PCell, cell 2 is the PSCell and Cell 3 the target cell.

Table A.5.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

	Configuration	Description
1		FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note	: The UE is only re	equired to pass in one of the supported test configurations

Table A.5.7.1.1.2-2: SS-RSRP Intra frequency general test parameters

DoromotorNote 5	I Imit	Te	st 1	Tes	st 2	Test 3	
Parameter <sup>Note 5</sup>	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN		fre	q1	freq1		freq1	
Duplex mode		TI	DD D	TDD		TDD	
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	onf.3.1
BWchannel	MHz	100: N	RB,c = 66	100: N <sub>F</sub>	RB,c = 66	100: N <sub>F</sub>	RB,c = 66
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-	SR.3.1 TDD	1
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated CORESET Reference Channel		CCR.3. 1 TDD	-	CCR.3. 1 TDD	-	CCR.3. 1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SSB configuration		SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2
SMTC configuration		SMTC.	SMTC.	SMTC. 1	SMTC. 1	SMTC.	SMTC.
Time offset with Cell 2	μS	-	3	-	3	-	3
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH to PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH to PDSCH_DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note	dB	0	0	0	0	0	0
$\hat{E}_s/N_{oc}$	dB	6	1	6	1	3	-1
Propagation conditions				Δ\Λ	'GN		

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: All parameters apply for configuration 1 and 2

Table A.5.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

Parameter <sup>Note 6</sup>		Unit	Test 1		st 1 Test 2		Test 3	
		Offic	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration			According to section A.3.8.X		•		According to According section A.3.8.X section A.3	
	NR_TDD_FR2_A						TE	3D
	NR_TDD_FR2_B						TE	3D
$N_{oc}$ Note1 NR_TDD_FR2_F		dBm/15kHz <sup>N</sup>	TBD		TBD		TBD	
	NR_TDD_FR2_G	ote4	e4 IBD	טט	טפו		TBD	
	NR_TDD_FR2_T						TBD	
	NR_TDD_FR2_Y						TE	3D

NR_TDD_FR2_A							TBD		
	NR_TDD_FR2_B						TE	3D	
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>	TBD		TBD		TBD		
OC .	NR_TDD_FR2_G	3	10	טט	10	טט	TE	3D	
	NR_TDD_FR2_T						TBD		
	NR_TDD_FR2_Y						TBD		
	NR_TDD_FR2_A						TBD	TBD	
	NR_TDD_FR2_B	dBm/SCS Note4	TBD	TBD	TBD TBD	TBD	TBD	TBD	
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F						TBD	TBD	
	NR_TDD_FR2_G						TBD	TBD	
	NR_TDD_FR2_T						TBD	TBD	
	NR_TDD_FR2_Y						TBD	TBD	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD	TBD	TBD	
	NR_TDD_FR2_A						TE	3D	
	NR_TDD_FR2_B						TE	3D	
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	-	חס	т.	ח	TE	3D	
10	NR_TDD_FR2_G	MHz Note4	10	3D	TBD		TE	3D	
	NR_TDD_FR2_T						TE	3D	
	NR_TDD_FR2_Y						TBD		

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the guiet zone
- Note 6: All parameters apply for configuration 1 and 2

#### A.5.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in sections 10.1.3.1.1 and relative accuracy requirements in section 10.1.3.1.2.

# A.5.7.1.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

## A.5.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 10.1.5.1.1 and 10.1.5.1.2 for intra frequency measurements with the testing configurations for NR cells in Table A.5.7.1.2.1-1.

Table A.5.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

Configuration	Description
1	FDD LTE PCell, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	TDD LTE PCell, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	FDD LTE PCell, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	TDD LTE PCell, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

### A.5.7.1.2.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.2.2-1 and Table

A.5.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP intra frequency measurements are tested by using the parameters in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2. The inter frequency measurements are supported by a measurement gap.

Table A.5.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Parameter Con  SSB ARFCN 1  BWchannel 1  Duplex mode 1  TDD configuration 1  PDSCH Reference measurement channel RMSI CORESET Reference Channel Dedicated CORESET Reference Channel SSB configuration 1  SSB configuration 1  Initial BWP Configuration 1  SSB ARFCN 1  1  BWchannel 1  1  TOD configuration 1  1  SCB Configuration 1  Initial BWP Configuration 1  SSB ARFCN 1  1	•	Unit	0.11.0		Test 2		
BW <sub>channel</sub> 1~  Duplex mode 1~  TDD configuration 1~  PDSCH Reference measurement channel  RMSI CORESET Reference Channel  Dedicated CORESET Reference Channel  SSB configuration 1,3,4  OCNG Patterns 1~  Initial BWP 1	4		Cell 2 Cell 3		Cell 2	Cell 3	
Duplex mode 1~ TDD configuration 1~ PDSCH Reference measurement channel RMSI CORESET Reference Channel Dedicated CORESET Reference Channel SSB configuration 1,2 OCNG Patterns 1~ Initial BWP 1			freq1	freq2	freq1	freq2	
TDD configuration 1~  PDSCH Reference measurement channel 1~  RMSI CORESET Reference Channel Dedicated CORESET Reference Channel 5SB configuration 1,3,4  OCNG Patterns 1~  Initial BWP 1	4		10 N <sub>RB,c</sub>		100: N <sub>RB,c</sub> = 66		
PDSCH Reference measurement channel  RMSI CORESET Reference Channel  Dedicated CORESET Reference Channel  SSB configuration  OCNG Patterns  Initial BWP	4		TDD	TDD	TDD	TDD	
measurement channel  RMSI CORESET Reference Channel  Dedicated CORESET Reference Channel  SSB configuration  OCNG Patterns  Initial BWP	4		TDDC	onf.3.1	TDDC	onf.3.1	
Reference Channel  Dedicated CORESET Reference Channel  SSB configuration  OCNG Patterns Initial BWP	4		SR.3.1 TDD	-	SR.3.1 TDD	-	
Reference Channel  SSB configuration  OCNG Patterns Initial BWP	4		CR.3.1 TDD	-	CR.3.1 TDD	-	
OCNG Patterns 1~ Initial BWP	-		CCR.3.1 TDD	-	CCR.3.1 TDD	-	
OCNG Patterns 1~ Initial BWP			SSB.1		SSB.1		
Initial BWP			SSB.2		SSB.2		
	4		OF DI DIA		OF		
	4		DLBW ULBW		DLBWP.0.1 ULBWP.0.1		
Dedicated BWP 1~	4		DLBW ULBW		DLBWP.1.3 ULBWP.1.3		
TRS Configuration 1~	4		TRS.2.	1 TDD	TRS.2.1 TDD		
PDCCH/PDSCH TCI Configuration 1~	4		TCI.S	tate.2	TCI.State.2		
SMTC configuration 1~	4		SMT	C.1	SMTC.1		
Time offset between Cell 2 and Cell 3	4	μs	3	3	3		
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1	4	dB	0	0	0	0	
Propagation condition 1~			AWGN AWGN				

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Table A.5.7.1.2.2-2: SS-RSRP inter-frequency OTA related test parameters

Doromotor	Config	l lmi4	Tes	Test 1 Cell 2 Cell 3		NOTE 3		
Parameter	Config	Unit	Cell 2			Cell 3		
$N_{oc}$	1~4	dBm/15 kHz	TBD		n.a	ı.		
$N_{oc}$	1,2	dBm/SS				TBD		ı.
oc .	3,4	B SCS	TBD		n.a.			
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	1~4	dB	TBD	TBD	TBD n.a.			
OO DODDNoted	1,2	dBm/SC	TB	BD	As in Table	e B.2.3-2		
SS-RSRP <sup>Note1</sup>	3,4	S	TBD		As in Table B.2.3-2			
IO <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	TBD		SS-RSRF	°+28.98		
$\hat{E}_s/N_{oc}$	1~4	dB	TBD	TBD	n.a.			

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.5.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the requirements in sections 10.1.5.1.1 and 10.1.5.1.2.

# A.5.7.1.3 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

## A.5.7.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.5.7.1.3.1-1.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

Table A.5.7.1.3.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz	
	bandwidth, FDD duplex mode	
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz	
	bandwidth, TDD duplex mode	
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz	
	bandwidth, TDD duplex mode	120 kHz SSB SCS, 100 MHz
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz	bandwidth, TDD duplex mode
	bandwidth, FDD duplex mode	
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz	
	bandwidth, TDD duplex mode	
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz	
	bandwidth, TDD duplex mode	
Note: The L	JE is only required to be tested in one of the su	pported test configurations

## A.5.7.1.3.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2 below. Both absolute and relative accuracy of RSRP intra frequency measurements are tested by using the parameters in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2. The inter frequency measurements are supported by a measurement gap.

Table A.5.7.1.3.2-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Contid Unit		Test 1		st 2	
Farameter	Coming	Ollit	Cell 2	Cell 3	Cell 2	Cell 3	
SSB ARFCN	1~6		freq1	freq2	freq1	freq2	
	1,4		10: N <sub>RB,c</sub> = 52 10:		10: N <sub>RB,c</sub> = 52		
BWchannel	2,5	MHz	$N_{RB,c} = 52$	100: N <sub>RB,c</sub> = 66	10: N <sub>RB,c</sub> = 52	100: $N_{RB,c} = 66$	
	3,6		40: N <sub>RB,c</sub> = 106		40: N <sub>RB,c</sub> = 106		
	1,4		FDD		FDD		
Duplex mode	2,5		TDD	TDD	TDD	TDD	
	3,6		TDD		TDD		
	1,4		N/A		N/A		
TDD configuration	2,5		TDDConf. 1.1	TDDConf.	TDDConf. 1.1	TDDConf. 3.1	
-	3,6		TDDConf. 2.1	3.1	TDDConf. 2.1	3.1	
DD00LLD-f	1,4		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Reference measurement channel	2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	
measurement channel	3,6		SR.2.1 FDD		SR.2.1 FDD		
DMCI CODECET	1,4		CR.1.1 FDD	-	CR.1.1 FDD	-	
RMSI CORESET Reference Channel	2,5		CR.1.1 TDD	-	CR.1.1 TDD	-	
Reference Charmer	3,6		CR.2.1 FDD	-	CR.2.1 FDD	-	
Dedicated CORESET	1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-	
Reference Channel	2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-	
Reference Charmer	3,6		CCR.2.1 TDD	-	CCR.2.1 TDD	-	
	1,4		SSB.1 FR1		SSB.1 FR1		
SSB configuration	2,5		SSB.1 FR1	SSB.1 FR2	SSB.1 FR1	SSB.1 FR2	
	3,6		SSB.2 FR1		SSB.2 FR1		

OCNG Patterns	1~6		OF	P.1	OP.1		
Initial BWP	1~6		DLBW	/P.0.1	DLBW	/P.0.1	
Configuration	1~0		ULBW	/P.0.1	ULBWP.0.1		
Dedicated BWP	1~6		DLBW	/P.1.3	DLBW	/P.1.3	
configuration	1~0		ULBW	/P.1.3	ULBW	/P.1.3	
TRS Configuration	1~6		TRS.2	.1 TDD	TRS.2	.1 TDD	
PDCCH/PDSCH TCI	1~6		TCLS	tate.2	TCLS	tate.2	
Configuration	1~0		101.5	iale.2	101.3	lale.2	
SMTC configuration	1~6		SMT	ΓC.1	SMT	ΓC.1	
Time offset between	1~6		,		,		
Cell 2 and Cell 3	1~6	μs	3		3		
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH							
DMRS to SSS							
EPRE ratio of PBCH to							
PBCH DMRS  EPRE ratio of PDCCH							
DMRS to SSS							
EPRE ratio of PDCCH to							
PDCCH DMRS	1~6	dB	0	0	0	0	
EPRE ratio of PDSCH							
DMRS to SSS							
EPRE ratio of PDSCH to							
PDSCH DMRS							
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>							
EPRE ratio of OCNG to							
OCNG DMRS Note 1							
Propagation condition	1~6	-	AWGN		AW	'GN	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Table A.5.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters

Parameter	Config	Unit	Tes	st 1	Test 2	NOTE 3		
Farameter	Coming	Offic	Cell 2	Cell 3	Cell 2	Cell 3		
$N_{oc}$	1~4	dBm/15 kHz	TBD		TBD n		n.a	<b>1</b> .
$N_{oc}$	1,2	dBm/SS	TBD		n.a	ì.		
1 oc	3,4	B SCS	TBD		n.a.			
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	1~4	dB	TBD TBD		n.a.			
SS-RSRP <sup>Note1</sup>	1,2 dBm/SC		TB	D	As in Table	e B.2.3-2		
33-K3KF****	3,4	S	TBD		As in Table B.2.3-2			
lo <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	TBD		SS-RSRF	P+28.98		
$\hat{E}_s/N_{oc}$	1~4	dB	TBD TBD		n.a.			

Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

## A.5.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 3 shall fulfil the Absolute requirement in section 10.1.5.1.1.

## A.5.7.2 SS-RSRQ

# A.5.7.2.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

## A.5.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.8.1.1.

#### A.5.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.5.7.2.1.2-2 and Table A.5.7.2.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in section A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.5.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

Co	nfiguration	Description
1		FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to pass in one of the supported test configurations

Table A.5.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

Dor	ameter	Unit	Tes	t 1	Tes	t 2	Test 3	
Far	ameter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			Freq1		Freq1		Freq1	
Duplex mode			TDD		TDD		TDD	
TDD configuration			TDDCc		TDDCc		TDDConf.3.1	
BW <sub>channel</sub>		MHz	100: N <sub>R</sub>	$_{B,c} = 66$	100: N <sub>RI</sub>		100: N <sub>F</sub>	RB,C = 66
	Initial DL BWP				DLBW			
BWP configuration	BWP configuration Dedicated DL BWP				DLBW			
3	Initial UL BWP				ULBW			
	Dedicated UL BWP		TDO	I	ULBW	P.1.1	TDO	<u> </u>
TRS configuration			TRS.2. 1 TDD		TRS.2.1 TDD		TRS.2. 1 TDD	
			TCI.Sta		TCI.Stat		TCI.St	
TCI state			te.0		e.0		ate.0	
			SR.3.1		SR.3.1		SR.3.1	
PDSCH Reference	measurement channel		TDD		TDD		TDD	
DATE OF THE PARTY			CR.3.1		CR.3.1		CR.3.1	
RMSI CORESET Reference Channel			TDD	-	TDD	-	TDD	-
Control channel RMC			CCR.3.	_	CCR.3.	_	CCR.3	_
Control Charmer Rivic			1 TDD	_	1 TDD	_	.1 TDD	_
OCNG Patterns			OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration			SMTC.1				000 /	
SSB configuration			SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2
PDSCH/PDCCH sul	hoorrior apooina	kHz	120	120	120	120	120	120
SS-RSSI-Measurem		KIIZ	120	120	Not App		120	120
EPRE ratio of PSS t					Νοι Αρρ	ilicable		
EPRE ratio of PBCh								
EPRE ratio of PBCh								
EPRE ratio of PDC0								
	CH to PDCCH_DMRS	dB						
	EPRE ratio of PDSCH_DMRS to SSS		0	0	0	0	0	0
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>								
EPRE ratio of OCNG to OCNG DMRS Note 1								
$\hat{E}_s/N_{oc}$		dB	3	3	-2.9	-2.9	-4	-4

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.5.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

Dana		1121	Tes	st 1	Tes	st 2	Test 3	
Para	meter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival config	guration		Accor	ding to	According to		According to	
Angle of anival comi			section A.3.15.1		section A.3.15.1		section A.3.15.1	
	NR_TDD_FR2_A						-118	
	NR_TDD_FR2_B						-117.5	
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/15kHz <sup>N</sup>	_0	95	-1	00	-115.5	
	NR_TDD_FR2_G	ote4			00	-115		
	NR_TDD_FR2_T							09
	NR_TDD_FR2_Y							06
	NR_TDD_FR2_A							09
	NR_TDD_FR2_B							8.5
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>	5	36	-6	11		6.5
	NR_TDD_FR2_G	3	-86		-91		-106	
	NR_TDD_FR2_T						-100	
	NR_TDD_FR2_Y					•		7
	NR_TDD_FR2_A						-113	-113
	NR_TDD_FR2_B						-112.5	-112.5
SS-RSRPNote2	NR_TDD_FR2_F	dBm/SCS	-83	-83	-94	-94	-110.5	-110.5
	NR_TDD_FR2_G	Note4	00		0 1	0 1	-110	-110
	NR_TDD_FR2_T						-104	-104
	NR_TDD_FR2_Y						-101	-101
	NR_TDD_FR2_A							
	NR_TDD_FR2_B							
SS-RSRQ Note2	NR_TDD_FR2_C	dB	-14.77	-14.77	-16.76	-16.76	-17.34	-17.34
	NR_TDD_FR2_D							
	NR_TDD_FR2_E	1						
	NR_TDD_FR2_F							
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	-1.76	-1.76	-4.7	-4.7	-5.46	-5.46
	NR_TDD_FR2_A						-77	'.47
	NR_TDD_FR2_B	7						5.97
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04		50	-5	:0	-74	.97
10	NR_TDD_FR2_G	MHz Note4	-:	JU	-5	13	-74	.47
	NR_TDD_FR2_T						-68	5.47
	NR_TDD_FR2_Y						-65	.47

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

## A.5.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.8.1.1.

Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 6: NR operating band groups are as defined in Section 3.5.2.

# A.5.7.2.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

## A.5.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

#### A.5.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 alnd Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test setup in Table A.5.7.2.2.2-2 and Table A.5.7.2.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.5.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A. 5.7.2.2.2-2: SS-RSRQ Inter frequency general test parameters

Parameter	l Init	Test 1	Test 2	Test 3		
Parameter	Unit	Cell 2 Cell 3	Cell 2 Cell 3	Cell 2 Cell 3		

SSB ARFCN		Freq1	freq2	freq1	Freq2	freq1	Freq2
Duplex mode		T	DD	TE	DD	TE	DD
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	RB,c = 66	100: N <sub>F</sub>	RB,C = 66	100: N <sub>F</sub>	$R_{B,c} = 66$
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-	SR.3.1 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0	0	0
EPRE ratio of PDSCH_DMRS to SSS							
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>							
$\hat{E}_s/N_{oc}$	dB	-1.75	-1.75	-1.75	-1.75	3	-1.75

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A. 5.7.2.2.3: SS-RSRQ Inter frequency OTA related test parameters

Poro	motor	Unit	Tes	st 1	Tes	st 2	Test 3	
Para	meter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
AoA setup			Set	up 1	Set	up 1	Setu	лр 1
Relative difference in	angle of arrival of	degrees	NA	0	NA	0	NA 0	
cell 2 relative to cell 1		uegrees	INA	U	INA	U	INA	0
	NR_TDD_FR2_A						-1	18
	NR_TDD_FR2_B						-11	7.5
$N_{oc}^{\text{Note1}}$	NR_TDD_FR2_F	dBm/15kHz <sup>N</sup>		95	1	00	-11	5.5
	NR_TDD_FR2_G	ote4	-3	75	-1	00	-115	
	NR_TDD_FR2_T				İ		-109	
	NR_TDD_FR2_Y						-106	
	NR_TDD_FR2_A						-109	
	NR_TDD_FR2_B		-86				-10	8.5
$N_{oc}$ Note1	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>			ي.	14	-10	6.5
	NR_TDD_FR2_G	3	-0	00	-8	<i>1</i> I	-1	06
	NR_TDD_FR2_T						-1	00
	NR_TDD_FR2_Y						-6	7
	NR_TDD_FR2_A						-113	-113
	NR_TDD_FR2_B						-112.5	-112.5
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	02	02	0.4	0.4	-110.5	-110.5
33-K3KP	NR_TDD_FR2_G	Note4	-83	-83	-94	-94	-110	-110
	NR_TDD_FR2_T						-104	-104
	NR_TDD_FR2_Y						-101	-101

SS-RSRQ <sup>Note2</sup>	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dB	TBD	TBD	TBD	TBD	TBD	TBD
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
	NR_TDD_FR2_A						-77	.47
	NR_TDD_FR2_B						-76	5.97
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	_	-50		59	-74	.97
10	NR_TDD_FR2_G	MHz Note4	-5	00	-5	פּוּ	-74	.47
	NR_TDD_FR2_T						-68	3.47
	NR_TDD_FR2_Y						-65	.47

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the guiet zone
- Note 6: NR operating band groups are as defined in Section 3.5.2.

## A.5.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.9.1.1 and 10.1.9.1.2.

### A.5.7.3 SS-SINR

# A.5.7.3.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

## A.5.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.1.1.

#### A.5.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.5.7.3.1.2-2 and Table A.5.7.3.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in section A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.5.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

Co	nfiguration	Description
1		FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to pass in one of the supported test configurations

Table A.5.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parameter	Unit	Tes	st 1		st 2	Tes	st 3
Parameter	Onit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN		Freq2 Fre			eq2	Fre	eq2
Duplex mode		TDD TDD TDD					
TDD configuration			onf.3.1	TDDC		TDDC	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	RB,c = 66		$R_{B,c} = 66$	100: N <sub>F</sub>	$R_{B,C} = 66$
Downlink initial BWP configuration					VP.0.1		
Downlink dedicated BWP configuration					VP.1.1		
Uplink initial BWP configuration					VP.0.1		
Uplink dedicated BWP configuration				ULBV	VP.1.1		
DRX cycle configuration	ms			Not ap	plicable		
TRS configuration				TRS.2	.1 TDD		
TCI state					State.0		
AoA setup			S	etup 3 defi	ned in A.3.		
PDSCH Reference measurement channel		SR.3.1		SR.3.1		SR.3.1	
1 DOCT Reference measurement channel		TDD		TDD		TDD	
RMSI CORESET Reference Channel		CR.3.1	_	CR.3.1	_	CR.3.1	_
		TDD	_	TDD	_	TDD	_
Dedicated RMSI CORESET Reference		CCR.3	_	CCR.3.	_	CCR.3.	_
Channel		.1 TDD	_	1 TDD	_	1 TDD	
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration					TC.1		
SSB configuration		SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
SS-RSSI-Measurement					plicable		
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS			_		_		_
EPRE ratio of PDSCH_DMRS to SSS	dB	0	0	0	0	0	0
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSSNote 1							
EPRE ratio of OCNG to OCNG DMRS Note 1							
$\hat{E}_s/N_{oc}$	dB	TBD	TBD	TBD	TBD	TBD	TBD
81 00	-						

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.5.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

Dow	ameter	Unit	Tes	st 1	Tes	st 2	Tes	st 3	
Para	ameter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3	
Angle of arrival conf	iguration			ding to	According to		According to		
Angle of anivar com	•		section	A.3.8.X	section A.3.8.X		section A.3.8.X		
	NR_TDD_FR2_A							3D	
	NR_TDD_FR2_B						TBD		
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/15kHz TBD TBI				RD.		3D	
	NR_TDD_FR2_G	Note4		,,,				3D	
	NR_TDD_FR2_T					_		3D	
	NR_TDD_FR2_Y						TBD		
	NR_TDD_FR2_A							BD	
37	NR_TDD_FR2_B							BD	
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS	TE	3D	TF	3D		3D	
	NR_TDD_FR2_G	Note3		,,,			TBD		
	NR_TDD_FR2_T							TBD	
	NR_TDD_FR2_Y			ı			TBD		
	NR_TDD_FR2_A						TBD TBD		
	NR_TDD_FR2_B								
SS-RSRPNote2	NR_TDD_FR2_F	dBm/SCS	TBD	TBD	TBD	TBD	TBD	TBD	
00 110111	NR_TDD_FR2_G	Note4					TBD	TBD	
	NR_TDD_FR2_T						TBD	TBD	
	NR_TDD_FR2_Y						TBD	TBD	
	NR_TDD_FR2_A						TBD	TBD	
	NR_TDD_FR2_B						TBD	TBD	
SS-SINR Note2	NR_TDD_FR2_C	dB	TBD	TBD	TBD	TBD	TBD	TBD	
	NR_TDD_FR2_D						TBD	TBD	
	NR_TDD_FR2_E						TBD	TBD	
<b>^</b>	NR_TDD_FR2_F						TBD	TBD	
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	TBD	TBD	TBD	TBD	TBD	TBD	
	NR_TDD_FR2_A						TE	3D	
	NR_TDD_FR2_B	dDm/05.04					TE	3D	
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04 MHz		3D	т.	3D		3D	
10	NR_TDD_FR2_G	IVIMZ Note4	"	טט	"	טט		3D	
	NR_TDD_FR2_T						TE	3D	
	NR_TDD_FR2_Y							3D	

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

## A.5.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in section 10.1.13.1.1.

Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 6: NR operating band groups are as defined in Section 3.5.2.

# A.5.7.3.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

## A.5.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

#### A.5.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 alnd Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test setup in Table A.5.7.3.2.2-2 and Table A.5.7.3.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.5.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A. 5.7.2.2.2-2: SS-SINR Inter frequency general test parameters

Daramatar	I Imit	Test 1		Tes	st 2	Test 3	
Parameter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3

freq1

Freq2

Freq2

SSB ARFCN

Freq1

freq2

freq1

D. and a conservation		, T	<u> </u>		<u> </u>	, T.	<u> </u>	
Duplex mode		TDD TDD TDD						
TDD configuration			onf.3.1		onf.3.1		onf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	RB,c = 66		RB,c = 66	100: N <sub>F</sub>	RB,C = 66	
Downlink initial BWP configuration					/P.0.1			
Downlink dedicated BWP configuration					/P.1.1			
Uplink initial BWP configuration					/P.0.1			
Uplink dedicated BWP configuration				ULBV	/P.1.1			
DRX cycle configuration	ms				plicable			
TRS configuration				TRS.2	.1 TDD			
TCI state					tate.0			
AoA setup			Se	etup 3 defii	ned in A.3.	15		
PDSCH Reference measurement channel		SR.3.1	_	SR.3.1	_	SR.3.1	_	
FDSCIT Reference measurement channel		TDD	_	TDD	-	TDD	-	
		CR.3.1		CR.3.1		CR.3.1		
RMSI CORESET Reference Channel		TDD	-	TDD	-	TDD	-	
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1	
SMTC configuration		SMTC.	SMTC.	SMTC.	SMTC.	SMTC.	SMTC.	
•		1 FR2	1 FR2	1 FR2	1 FR2	1 FR2	1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120	
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0	0	0	
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSSNote 1								
$\hat{E}_s/N_{oc}$	dB	TBD	TBD	TBD	TBD	TBD	TBD	
	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral							
•	density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over							
Note 2. Interretelle nom other cells and r	ivise sources f	IOL SDECINE	ani me tes	เ เอ สออนไไโ	eu 10 DE CC	ภาอเสมเ 0۷6	3 I	

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-SINR, SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A. 5.7.2.2.3: SS-SINR Inter frequency OTA related test parameters

Doromotor		Unit	Tes	st 1	Test 2		Test 3	
Para	Parameter		Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
UE orientation around TBD axis and TBD axis		degrees	TBD		TBD TBD		TE	BD
Relative difference in cell 2 relative to cell	e difference in angle of arrival of degrees NA		NA	TBD	NA 0		NA	0
	NR_TDD_FR2_A			,		TE	3D	
	NR_TDD_FR2_B		THE PART OF THE PROPERTY OF TH		TBD           TBD           TBD		TBD	
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/15kHz					TBD	
	NR_TDD_FR2_G	Note4					3D	
	NR_TDD_FR2_T							3D
	NR_TDD_FR2_Y						TBD	
N Note1	NR_TDD_FR2_A	-ID (000				TE	3D	
TV oc	NR_TDD_FR2_B	dBm/SCS Note3	TE	3D	TE	3D	TE	BD.
	NR_TDD_FR2_F						TE	3D

	NR_TDD_FR2_G						TE	3D
	NR_TDD_FR2_T						TE	3D
	NR_TDD_FR2_Y						TE	3D
	NR_TDD_FR2_A						TBD	TBD
	NR_TDD_FR2_B						TBD	TBD
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	TBD	TBD	TBD	TBD	TBD	TBD
33-K3KF*****	NR_TDD_FR2_G	Note4	טסו	טסו	טסו	טסו	TBD	TBD
	NR_TDD_FR2_T						TBD	TBD
	NR_TDD_FR2_Y						TBD	TBD
	NR_TDD_FR2_A						TBD	TBD
	NR_TDD_FR2_B	dB	TBD	TBD	TBD		TBD	TBD
SS-SINR <sup>Note2</sup>	NR_TDD_FR2_F					TBD	TBD	TBD
33-31NK.18182	NR_TDD_FR2_G					IBD	TBD	TBD
	NR_TDD_FR2_T						TBD	TBD
	NR_TDD_FR2_Y						TBD	TBD
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD	TBD	TBD
	NR_TDD_FR2_A						TE	3D
	NR_TDD_FR2_B						TE	3D
IoNote2	NR_TDD_FR2_F	dBm/95.04		חס		3D	TE	3D
10	NR_TDD_FR2_G	MHz Note4	16	3D	16	טט	TE	3D
	NR_TDD_FR2_T						TE	3D
	NR_TDD_FR2_Y						TE	3D

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in Section 3.5.2.

## A.5.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in section 10.1.15.1.1 and 10.1.15.1.2.

## A.5.7.4 L1-RSRP measurement for beam reporting

## A.5.7.4.1 SSB based L1-RSRP measurement

#### A.5.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 9.5.2 and section 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.5.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in section A.3.15.

Table A.5.7.4.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

	Config	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3		LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4		LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

## A.5.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.5.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~4		freq1	freq1
Duplex mode	1~4		TDD	TDD
TDD Configuration	1~4		TDDConf.3.1	TDDConf.3.1
BWchannel	1~4	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1,2		SSB.1 FR2	SSB.1 FR2
33B configuration	3,4		SSB.2 FR2	SSB.2 FR2
OCNG Patterns	1~4		OP.1	OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~4		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2	TCI.State.2
SMTC configuration	1~4		SMTC.1	SMTC.1
reportConfigType	1~4		periodic	periodic
reportQuantity	1~4		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1~4		2	2
L1-RSRP reporting period	1~4		slot640	slot640
Propagation condition	1~4		AWGN	AWGN
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS	1~4	dB	0	0
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Parameter	Config	l lmi4	Test 1		Test 2 NOTE 3		
Parameter	Config	Unit	SSB0	SSB1	SSB0	SSB1	
$N_{oc}$	1~4	dBm/15 kHz	TBD		TBD n.a.		
$N_{oc}$	1,2	dBm/SS	TB	BD	n.a	a.	
oc .	3,4	B SCS	TBD		n.a.		
$\hat{E}_{s}/I_{ot}$	1~4	dB	TBD	TBD TBD		a.	
SS-RSRP <sup>Note1</sup>	1,2	dBm/SC	TB	BD	As in Table	e B.2.4-2	
33-K3KF****	3,4	S	TB	TBD		As in Table B.2.4-2	
Io <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	TBD		SS-RSRP+28.98		
$\hat{E}_s/N_{oc}$	1~4	dB	TBD TBD		n.a.		

Table A.5.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters

- Note 1: RSRP and lo levels have been derived from other parameters for information purposes.

  They are not settable parameters themselves.
- Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 3: No additional noise is added by the test system in Test 2.

## A.5.7.4.1.3 Test Requirements

For at least one reported L1-RSRP during 480ms, the accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in sections 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of TBD.

### A.5.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

## A.5.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Sections 9.5.3 and section 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in section A.3.15.

Table A.5.7.4.2.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

	Config	Description
1		LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

## A.5.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.5.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD Configuration	1~2		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2	SSB.1 FR2
OCNG Patterns	1~2		OP.1	OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2	TCI.State.2
SMTC configuration	1~2		SMTC.1	SMTC.1
CSI-RS	1~2		CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
reportConfigType	1~2		periodic	periodic
reportQuantity	1~2		cri-RSRP	cri-RSRP
Number of reported RS	1~2		2	2
L1-RSRP reporting period	1~2		slot640	slot640
Propagation condition	1~2		AWGN	AWGN
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH				
DMRS	4.0	٩D		0
EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH	1~2	dB	0	
DMRS				
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Table A.5.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

			Tes	Test 1		NOTE 3
Parameter	Config	Unit	CSI-RS0	CSI-RS1	CSI-RS0	CSI- RS1
$N_{oc}$	1~4	dBm/15 kHz	TBD		n.a.	
$N_{oc}$	1,2	dBm/SS	TE	TBD		l.
00	3,4	B SCS	TBD		n.a.	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	1~4	dB	TBD	TBD	n.a.	
SS-RSRP <sup>Note1</sup>	1,2	dBm/SC	TE	TBD As in Table B.2		B.2.4-2
33-K3KF****	3,4	S	TE	BD	As in Table B.2.4-2	
Io <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	TBD		SS-RSRP+28.98	
$\hat{E}_s/N_{oc}$	1~4	dB	TBD	TBD	n.a	ı <b>.</b>

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

## A.5.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in sections 10.1.20.2. The reported L1-RSRP value shall include the Rx antenna gain in the range of TBD.

## A.5.8 Void

## A.6 NR standalone tests with all NR cells in FR1

## A.6.1 SA: RRC\_IDLE state mobility

## A.6.1.1 Cell re-selection to NR

## A.6.1.1.1 Cell reselection to FR1 intra-frequency NR case

## A.6.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

#### A.6.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.1.2-1, A.6.1.1.1.2-2 and A.6.1.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table A.6.1.1.1.2-1: Supported test configurations

Co	nfiguration	ation Description					
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note:	,						

Table A.6.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case

	Parameter	Unit	Test configuration	Value	Comment
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
T2 end	Active cell		1, 2, 3	Cell2	
condition	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	
RF Channe	el Number		1, 2, 3	1	
Time offse	t between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Ba	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR1	•
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC con	figuration		1	SMTC	
	-			pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
				pattern 1	

DRX cycle length	S	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index		1, 2, 3	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3	Not configured	
T1	S	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2	S	1, 2, 3	40	T2 needs to be defined so that cell re- selection reaction time is taken into account.
ТЗ	S	1, 2, 3	15	T3 needs to be defined so that cell re- selection reaction time is taken into account.

Table A.6.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test		Cell 1			Cell 2	
		configuration	T1	T2	T3	T1	T2	T3
TDD configuration		1		N/A			N/A	
		2	TDDConf.1.1			DDConf.1		
		3	Т	DDConf.2.		TDDConf.2.1		.1
PDSCH RMC		1		R.1.1 FDD			N/A	
configuration		2	()	R.1.1 TDD				
		3	()	R.2.1 TDD				
RMSI CORESET		1	C	R.1.1 FDD			R.1.1 FD	
RMC configuration		2		R.1.1 TDD			R.1.1 TD	
		3		R.2.1 TDD			R.2.1 TD	
Dedicated CORESET		1		CR.1.1 FDI			CR.1.1 FD	
RMC configuration		2		CR.1.1 TDI			CR.1.1 TD	
		3		CR.2.1 TDI			CR.2.1 TD	
OCNG Pattern		1, 2, 3		defined in A	.3.2.1		lefined in a	
Initial DL BWP		1, 2, 3		DLBWP.0.1			LBWP.0.	1
configuration								
Initial UL BWP		1, 2, 3	ι	JLBWP.0.1		L	JLBWP.0.	1
configuration								
RLM-RS		1, 2, 3		SSB			SSB	
Qrxlevmin	dBm/SCS	1, 2		-140		-140		
		3		-137		-137		
Pcompensation	dB	1, 2, 3		0		0		
Qhysts	dB	1, 2, 3		0		0		
Qoffsets, n	dB	1, 2, 3	0		0			
Cell_selection_and_		1, 2, 3						
reselection_quality_				SS-RSRP			SS-RSRP	)
measurement								
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1	16	-3.11	2.79	-infinity	2.79	-3.11
s / Ot		2						
	i= (0.00	3						
$N_{oc}^{}$ Note2	dBm/SCS	1			-98			
OC.		2			-98			
		3			-95			
$N_{oc}$ Note2	dBm/15 kHz	1			-98			
00		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	16	13	16	-infinity	16	13
s / Oc		2						
N		3						
SS-RSRP Note3	dBm/SCS	1	-82	-85	-82	-infinity	-82	-85
		2	-82	-85	-82	-infinity	-82	-85
	/	3	-79	-82	-79	-infinity	-79	-82
lo	dBm/9.36 MHz	1	-53.94	-52.21	-52.21	pecified	in Cell 1 c	columns-
	dBm/9.36 MHz	2	-53.94	-52.21	-52.21	1		
	dBm/38.16 MHz	3	-47.85	-46.12	-46.12			_
Treselection	S	1, 2, 3	0	0	0	0	0	0
Sintrasearch	dB	1, 2, 3		N50			N50	
Propagation		1, 2, 3			AWG	SN		
Condition								

Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers Note 2:

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled. SS-RSRP levels have been derived from other parameters for information purposes. They are not settable Note 3: parameters themselves.

### A.6.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{detect, NR\_Intra} + T_{SI-NR}$ , and to an already detected cell can be expressed as:  $T_{evaluate, NR\_intra} + T_{SI-NR}$ ,

#### Where:

 $T_{\text{detect, NR\_Intra}} \hspace{1.5cm} \text{See Table 4.2.2.3-1 in clause 4.2.2.3} \\ T_{\text{evaluate, NR\_intra}} \hspace{1.5cm} \text{See Table 4.2.2.3-1 in clause 4.2.2.3} \\$ 

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280ms is assumed in this test case.

This gives a total of 33.28 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.68 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

## A.6.1.1.2 Cell reselection to FR1 inter-frequency NR case

#### A.6.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

#### A.6.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.6.1.1.2.2-1, A.6.1.1.2.2-2 and A.6.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

Table A.6.1.1.2.2-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell		
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD	15 kHz SSB SCS, 10 MHz bandwidth, FDD		
	duplex mode	duplex mode		
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD	15 kHz SSB SCS, 10 MHz bandwidth, TDD		
	duplex mode	duplex mode		
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD	30 kHz SSB SCS, 40 MHz bandwidth, TDD		
	duplex mode	duplex mode		
Note: The UE is only required to be tested in one of the supported test configurations.				

Table A.6.1.1.2.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case

	Parameter	Unit	Test	Value	Comment
	1		configuration		
Initial	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial
condition					phase and during T1 period the UE
	A .: II		4.0.0	0 114	reselects to cell 1
T1 end	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1
condition	Neighbour cells		1, 2, 3	Cell2	during T1
T3 end	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2
condition					with higher priority during T3
RF Channe	el Number		1, 2, 3	1, 2	
Time offset	t between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Ba	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access
	· ·				procedure.
SSB config	guration		1	SSB.1 FR1	·
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC conf	figuration		1	SMTC	
				pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
				pattern 1	
DRX cycle		S	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH co	nfiguration index		1, 2, 3	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBe	estCell		1, 2, 3	Not	
_				configured	
T1		S	1, 2, 3	15	T1 needs to be defined so that cell re-
					selection reaction time is taken into
					account.
T2		S	1, 2, 3	>7	During T2, cell 2 shall be powered off,
					and during the off time the physical cell
					identity shall be changed. The intention is
					to ensure that cell 2 has not been
					detected by the UE prior to the start of
Тэ			1 0 0	75	period T3.  T3 needs to be defined so that cell re-
T3		S	1, 2, 3	75	selection reaction time is taken into
[					account.

Table A.6.1.1.2.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test	Test Cel		Cell 1		Cell 2	
		configuration	T1	T2	T3	T1	T2	T3
TDD configuration		1	1 N/A 2 TDDConf.1.1		N/A			
		2			Т	DDConf.1.	1	
	3		TDDConf.2.1			TDDConf.2.1		
PDSCH RMC		1	SR.1.1 FDD		SR.1.1 FDD N/A		N/A	
configuration		2	;	SR.1.1 TDD				
		3	SR.2.1 TDD					
RMSI CORESET		1	CR.1.1 FDD CR.		R.1.1 FDD			
RMC configuration		2	CR.1.1 TDD		R.1.1 TDD	)		
		3		CR.2.1 TDD		C	R.2.1 TDD	)

Dedicated CORESET		1	С	CR.1.1 FDI	D	С	CR.1.1 FD	D
RMC configuration		2		CR.1.1 TDI			CR.1.1 TD	
I mile out in garantee		3			CR.2.1 TD			
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1 OP.1 defined in A					
Initial DL BWP		1, 2, 3		DLBWP.0.1			DLBWP.0.	
configuration		1, 2, 0	_	223111 1011			J_Do.	•
Initial UL BWP		1, 2, 3	ı	JLBWP.0.1		l	JLBWP.0.	1
configuration		., _, o	1			•		•'
RLM-RS		1, 2, 3		SSB			SSB	
Qrxlevmin	dBm/SCS	1, 2		-140			-140	
<u></u>	G2, 000	3		-137			-137	
Pcompensation	dB	1, 2, 3		0			0	
Qhysts	dB	1, 2, 3		0			0	
Qoffset <sub>s, n</sub>	dB	1, 2, 3		0			0	
Cell_selection_and_	45	1, 2, 3						
reselection_quality_		1, 2, 0		SS-RSRP			SS-RSRP	
measurement								
	dB	1	14	14	14	-4	-infinity	12
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		2						
		3						
A.I. Noto?	dBm/SCS	1	-98					
$N_{oc}$ Note2	G2, 000	2	-98					
		3	-95					
λ/ Note2	dBm/15 kHz	1			-98			
$N_{oc}^{}$ Note2		2	1					
		3	1					
$\hat{E}_s/N_{oc}$	dB	1	14	14	14	-4	-infinity	12
$E_s/IV_{oc}$		2	1					
		3						
SS-RSRP Note3	dBm/SCS	1	-84	-84	-84	-102	-infinity	-86
		2	-84	-84	-84	-102	-infinity	-86
		3	-81	-81	-81	-99	-infinity	-83
lo	dBm/9.36 MHz	1	-55.88	-55.88	-55.88	-68.60	-infinity	-57.78
	dBm/9.36 MHz	2	-55.88	-55.88	-55.88	-68.60	-infinity	-57.78
	dBm/38.16 MHz	3	-49.79	-49.79	-49.79	-62.50	-infinity	-51.69
Treselection	S	1, 2, 3	0	0	0	0	0	0
Snonintrasearch	dB	1, 2, 3		50	•		Not sent	•
Thresh <sub>x, high</sub>	dB	1, 2, 3		48			48	
Thresh <sub>serving, low</sub>	dB	1, 2, 3		44			44	
Thresh <sub>x, low</sub>	dB	1, 2, 3		50			50	
Propagation		1, 2, 3	AWGN					
Condition								

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter} + T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR\_inter} + T_{SI-NR}$ ,

#### Where:

 $T_{higher\_priority\_search}$  See clause 4.2.2.7

T<sub>evaluate, NR\_ inter</sub> See Table 4.2.2.4-1 in clause 4.2.2.4

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## A.6.1.2 Inter-RAT E-UTRAN cell re-selection

## A.6.1.2.1 Cell reselection to higher priority E-UTRAN

### A.6.1.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 when the E-UTRAN cell is of higher priority.

## A.6.1.2.1.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.1.2-1, A.6.1.2.1.2-2, A.6.1.2.1.2-3 and A.6.1.2.1.2-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Table A.6.1.2.1.2-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
1	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	FDD duplex mode	
2	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	TDD duplex mode	
3	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	TDD duplex mode	
4	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	FDD duplex mode	
5	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	TDD duplex mode	
6	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	TDD duplex mode	
Note: The L	JE is only required to be tested in one of the sup	ported test configurations.

Table A.6.1.2.1.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

	Parameter	Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	during T2.
T3 end	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	during T3 for iteration of the tests.
Access Ba	rring Information	•	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle	length	s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACE	H configuration index		1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN index	PRACH configuration		1, 2, 3, 4, 5, 6	4	As specified in table 5.7.1-2 in TS 36.211 [23]
T1		S	1, 2, 3, 4, 5, 6	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		Ø	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re- selection reaction time is taken into account.
Т3		S	1, 2, 3, 4, 5, 6	15	T3 needs to be defined so that cell re- selection reaction time is taken into account.

Table A.6.1.2.1.2-3: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1		
		_	T1	T2	T3
TDD configuration		1, 4		N/A	
		2, 5	T	DDConf.1	1.1
		3, 6	T	DDConf.2	2.1
PDSCH parameters		1, 4	,	SR.1.1 FD	D
		2, 5	•	SR.1.1 TD	D
		3, 6	Ç	SR.2.1 TD	D
RMSI CORESET		1, 4	CR.1.1 FDD		
parameters		2, 5	CR.1.1 TDD		D
		3, 6	(	CR.2.1 TD	D
Dedicated CORESET		1, 4	C	CR.1.1 FI	OD
parameters		2, 5	O	CR.1.1 TI	OD
		3, 6	O	CR.2.1 TI	OD
SSB parameters		1, 4	SSB.1 FR1		
		2, 5		SSB.1 FR	.1
		3, 6		SSB.2 FR	1
NR SMTC parameters		1, 4	SMTC pattern 2		rn 2
		2, 5	SN	<b>MTC</b> patte	rn 1
		3, 6	SN	<b>MTC</b> patte	rn 1

OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 d	efined in	A.3.2.1
Initial DL BWP configuration		1, 2, 3, 4, 5, 6		DLBWP.0	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6		ULBWP.0	
RLM-RS		1, 2, 3, 4, 5, 6		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5		-140	
		3, 6		-137	
$N_{oc}$	dBm/SCS	1, 4		-98	
1 oc		2, 5		-98	
		3, 6		-95	
$N_{oc}$	dBm/15 kHz	3, 6 1, 2, 3, 4, 5, 6		-98	
1 oc					
SS-RSRP	dBm/SCS	1, 4	-84	-84	-84
		2, 5	-84	-84	-84
		3, 6	-81	-81	-81
$\hat{E}_{s}/I_{ot}$	dB	1, 4	14	14	14
$L_{\rm s}/L_{\rm ot}$		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4	14	14	14
$L_s/T_{oc}$		2, 5			
		3, 6			
lo	dBm/9.36 MHz	1, 4	-55.88	-55.88	-55.88
	dBm/9.36 MHz	2, 5	-55.88	-55.88	-55.88
	dBm/38.16 MHz	3, 6	-49.79	-49.79	-49.79
Treselection	S	1, 2, 3, 4, 5, 6		0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6		50	
Thresh <sub>x, high (Note 2)</sub>	dB	1, 2, 3, 4, 5, 6		48	
Thresh <sub>serving, low</sub>	dB	1, 2, 3, 4, 5, 6		44	
Thresh <sub>x, low</sub>	dB	1, 2, 3, 4, 5, 6		50	
Propagation Condition		1, 2, 3, 4, 5, 6		AWGN	

Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell

Table A.6.1.2.1.2-4: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2		
		T1	T2	Т3
E-UTRA RF Channel			1	
number				
BW <sub>channel</sub>	MHz		10	
OCNG Patterns defined in		OP.	2 TDD for	test
TS 36.133 [15] clause A.3.2		config	guration 1	, 2, 3;
			2 FDD for	
		confi	guration 4	, 5, 6
PBCH_RA	dB			
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB		0	
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA <sup>Note 1</sup>	dB			
OCNG_RBNote 1	dB			

Qrxlevmin	dBm		-140	
N <sub>oc</sub>	dBm/15 kHz		-98	
RSRP	dBm/15 KHz	-infinity	-86	-102
$\hat{E}_{s}/I_{ot}$	dB	-infinity	12	-4
$\hat{E}_s/N_{oc}$	dB	-infinity	12	-4
TreselectionEUTRAN	S		0	
Snonintrasearch	dB		Not sent	
Thresh <sub>x, high (Note 2)</sub>	dB	48		
Thresh <sub>serving, low</sub>	dB		44	
Thresh <sub>x, low</sub>	dB		50	
Propagation Condition			AWGN	

Note 2: This refers to the value of Thresh<sub>x</sub>, high which is included in E-UTRA system information, and is a threshold for the NR target cell

### A.6.1.2.1.3 Test Requirements

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, E-IITRAN} + T_{SLE-IITRA}$ .

## Where:

 $T_{higher\_priority\_search}$  See clause 4.2.2.7

T<sub>evaluate, E-UTRAN</sub> See Table 4.2.2.5-1 in clause 4.2.2.5

T<sub>SI-E-UTRA</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

## A.6.1.2.2 Cell reselection to lower priority E-UTRAN

## A.6.1.2.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

#### A.6.1.2.2.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.2.2-1, A.6.1.2.2.2-2, A.6.1.2.2.2-3 and A.6.1.2.2.2-4. The test consists of three successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

Table A.6.1.2.2.2-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
1	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	FDD duplex mode	
2	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	TDD duplex mode	
3	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	TDD duplex mode	
4	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	FDD duplex mode	
5	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	TDD duplex mode	
6	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	TDD duplex mode	
Note: The L	JE is only required to be tested in one of the sup	ported test configurations.

Table A.6.1.2.2.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE camps on cell 1 in the initial phase.
T1 end	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	during T1.
T2 end	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	during T2 for iteration of the tests.
Access Ba	Access Barring Information		1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle	DRX cycle length		1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACE	NR PRACH configuration index		1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 4, 5, 6	4	As specified in table 5.7.1-2 in TS 36.211 [23]
T1		Ø	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re- selection reaction time is taken into account.
T2		S	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re- selection reaction time is taken into account.

Table A.6.1.2.2.2-3: Cell specific test parameters for NR cell 1

Parameter	Unit	Unit Test configuration		1
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDCo	
		3, 6	TDDCo	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1	TDD
		3, 6	SR.2.1	TDD
RMSI CORESET RMC		1, 4	CR.1.1 FDD	
configuration		2, 5	CR.1.1	TDD
		3, 6	CR.2.1	TDD
Dedicated CORESET RMC		1, 4	CCR.1.1	I FDD
configuration		2, 5	CCR.1.	I TDD
		3, 6	CCR.2.	I TDD
SSB configuration		1, 4	SSB.1	FR1
		2, 5	SSB.1	FR1
		3, 6	SSB.2	
SMTC configuration		1, 4	SMTC pa	
		2, 5	SMTC pa	
		3, 6	SMTC pa	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBW	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBW	
RLM-RS		1, 2, 3, 4, 5, 6	SS	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-14	
Q.7	u2, 000	3, 6	-13	
λĭ	dBm/SCS	1, 4	-98	
$N_{oc}$	a5111/000	2, 5	-98	
		3, 6	-95	
λĭ	dBm/15 kHz	1, 2, 3, 4, 5, 6	-98	
$N_{oc}$	32.1,, 13.1.1.2	., _, 0, ., 0, 0		
SS-RSRP	dBm/SCS	1, 4	-102	-86
		2, 5	-102	-86
		3, 6	-99	-83
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1, 4	-4	12
$L_{\rm s}/L_{\rm ot}$		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-4	12
$E_s/W_{oc}$		2, 5		
		3, 6		
lo	dBm/9.36 MHz	1, 4	-68.60	-57.78
	dBm/9.36 MHz	2, 5	-68.60	-57.78
	dBm/38.16 MHz	3, 6	-62.50	-51.69
Treselection	S	1, 2, 3, 4, 5, 6	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	50	
Thresh <sub>x, high (Note 2)</sub>	dB	1, 2, 3, 4, 5, 6	48	
Thresh <sub>serving, low</sub>	dB	1, 2, 3, 4, 5, 6	44	
Thresh <sub>x, low</sub>	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	

OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

This refers to the value of Thresh<sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell Note 1:

Note 2:

Table A.6.1.2.2.2-4: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2		
		T1	T2	
E LITE A DE Obassas			T3	
E-UTRA RF Channel			1	
number BW <sub>channel</sub>	MHz		10	
OCNG Patterns defined in	IVITZ	10 OP.2 TDD for test		
TS 36.133 [15] clause A.3.2				
13 30.133 [13] clause A.3.2		configuration 1, 2, 3; OP.2 FDD for test		
		-	tion 4, 5, 6	
PBCH RA	dB	comigara		
PBCH RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB		_	
PHICH_RB	dB	0		
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA <sup>Note 1</sup>	dB			
OCNG_RB <sup>Note 1</sup>	dB			
Qrxlevmin	dBm	-140		
$N_{oc}$	dBm/15 kHz		98	
RSRP	dBm/15 KHz	-84	-84	
$\hat{E}_{s}/I_{ot}$	dB	14	14	
$\hat{E}_s/N_{oc}$	dB	14	14	
TreselectionEUTRAN	S	0		
Snonintrasearch	dB	Not sent		
Thresh <sub>x</sub> , high (Note 2)	dB	48		
Thresh <sub>serving, low</sub>	dB	44		
Thresh <sub>x, low</sub>	dB	50		
Propagation Condition			/GN	
Note 1: OCNG shall be used such that both cells are fully allocated				
and a constant total transmitted power spectral density is				
achieved for all OFDM symbols.  Note 2: This refers to the value of Threshy bigh which is included in F-				

Note 2: This refers to the value of Thresh<sub>x</sub>, high which is included in E-UTRA system information, and is a threshold for the NR target

## A.6.1.2.2.3 Test Requirements

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than  $8\ s.$ 

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: T<sub>evaluate, E-UTRAN</sub> + T<sub>SI-E-UTRA</sub>,

Where:

T<sub>evaluate, E-UTRAN</sub> See Table 4.2.2.5-1 in clause 4.2.2.5

T<sub>SI-E-UTRA</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

## A.6.2 SA: RRC\_INACTIVE state mobility

## A.6.3 RRC\_CONNECTED state mobility

## A.6.3.1 Handover

## A.6.3.1.1 Intra-frequency handover from FR1 to FR1; known target cell

### A.6.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

#### A.6.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.1.2-2, and A.6.3.1.1.2-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

Table A.6.3.1.1.2-1: Intra-frequency handover from FR1 to FR1 test configurations

	Config	Description
1		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
		Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
		Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
		Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only i	equired to be tested in one of the supported test configurations

Table A.6.3.1.1.2-2: General test parameters Intra-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	0	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random
				access procedure.
PRACH configuration index			FR1 PRACH configuration 1	As specified in table Table 6.3.3.2-
				3 in TS 38.211 [6]
Time offset between cells			3 us	Synchronous cells

T1	S	5	
T2	s	≤5	
T3	S	1	

Table A.6.3.1.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit		Cell 1			Cell 2	
			T1	T2	Т3	T1	T2	Т3
NR RF Channel Number			11		20	1		
Duplex mode	Config 1		FDD					
•	Config 2,3	TDD Not Applicable						
TDD configuration	Config 1							
TDD configuration	Config 2				TDDC			
	Config 3				TDDC			
BWchannel	Config 1	N 41 1-				$_{B,c} = 52$ $_{B,c} = 52$		
DVVchannel	Config 2 Config 3	MHz						
						$B_{B,c} = 106$ $B_{B,c} = 52$		
DMD DM	Config 1	N 41 1-			10. INR	B <sub>,C</sub> = 52		
BWP BW	Config 2	MHz			10. INR	B,c = 52		
DD: O I-	Config 3					$_{\rm a,c} = 106$		
DRx Cycle	0	ms				plicable		
PDSCH Reference	Config 1					1 FDD		
measurement channel	Config 2					1 TDD		
	Config 3				SR2.1			
CORESET Reference	Config 1					1 FDD		
Channel	Config 2					1 TDD		
OCNC Detterns	Config 3				OCNO.	1 TDD		
OCNG Patterns	Cartin 4.0		OCNG pattern 1 SMTC.1 FR1					
SMTC configuration	Config 1,2							
DDCCH/DDCCH	Config 3			SMTC.2 FR1 15 kHz				
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	30 kHz					
PUCCH/PUSCH	Config 3 Config 1,2		30 KHZ 15 kHz					
subcarrier spacing	Config 3	kHz				kHz		
PRACH configuration	Corning 5			FR1			ion 1	
BWP configuration	Initial DL BWP		FR1 PRACH configuration 1 DLBWP.0.1					
BWI configuration	Dedicated DL		DLBWP.0.1 DLBWP.1.1					
	BWP							
	Initial UL BWP					VP.0.1		
	Dedicated UL				ULBV	√P.1.1		
	BWP							
EPRE ratio of PSS to SS								
EPRE ratio of PBCH DM								
EPRE ratio of PBCH to F								
EPRE ratio of PDCCH D								
EPRE ratio of PDCCH to PDCCH DMRS		dB			(	)		
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
$N_{oc}^{}$ Note2		dBm/15kH z			-6	98		
Λ/ Note2 Config 1,2					-6	98		
$N_{oc}^{\text{Note2}}$ Config 1,2		dBm/SCS				95		
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	8	-3.3	-3.3	- Infinity	2.36	2.36

$\hat{E}_s/N_{oc}$		dB	8	8	8	- Infinity	11	11
Io <sup>Note3</sup>	Config 1,2	dBm/ 9.36MHz	-64.7	-60.87	-60.87	-64.7	-60.87	-60.87
Config 3		dBm/ 38.16MHz	-60.55	-57.36	-57.36	-60.55	-57.36	-57.36
Propagation	on condition	-	AWGN					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [220] ms from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [210]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of [220] ms.

# A.6.3.1.2 Intra-frequency handover from FR1 to FR1; unknown target cell

## A.6.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

## A.6.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.2.2-2, and A.6.3.1.2.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.6.3.1.2.2-1: Intra-frequency handover from FR1 to FR1 test configurations

	Config	Description
1		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
		Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
		Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
		Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only	required to be tested in one of the supported test configurations

Table A.6.3.1.2.2-2: General test parameters Intra-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions			Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	0	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Inf	ormation	-	Not Sent	No additional delays in random
				access procedure.
PRACH configuration	tion index		FR1 PRACH configuration 1	As specified in table Table 6.3.3.2-
_				3 in TS 38.211 [6]
Time offset between cells			3 µs	Synchronous cells
T1		S	5	
T2		S	≤5	

Table A.6.3.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		11	Ce	II 1	Cell 2			
		Unit	T1	T2	T1	T2		
NR RF Channel Number	•		1 1					
Duplex mode	Config 1		FDD					
Duplex mode	Config 2,3			TDD				
	Config 1			Not App				
TDD configuration	Config 2			TDDC				
	Config 3			TDDCc				
	Config 1			10: N <sub>RE</sub>				
BW <sub>channel</sub>	Config 2	MHz		10: N <sub>RE</sub>				
	Config 3			40: N <sub>RB</sub>	<sub>,c</sub> = 106			
	Config 1			10: N <sub>RE</sub>	$_{B,c} = 52$			
BWP BW	Config 2	MHz		10: N <sub>RE</sub>				
	Config 3			40: N <sub>RB</sub>				
DRx Cycle		ms		Not App				
PDSCH Reference	Config 1			SR.1.	I FDD			
measurement channel	Config 2		SR.1.1 TDD					
measurement channel	Config 3		SR2.1 TDD					
CORESET Reference	Config 1		CR.1.1 FDD					
Channel	Config 2		CR.1.1 TDD					
	Config 3		CR2.1 TDD					
OCNG Patterns				OCNG p				
SMTC configuration	Config 1,2			SMTC				
	Config 3			SMTC				
PDSCH/PDCCH	Config 1,2	kHz	15 kHz					
subcarrier spacing	Config 3	KLIZ	30 kHz					
PUCCH/PUSCH	Config 1,2	kHz		15 l				
subcarrier spacing	Config 3	IXI IZ	30 kHz					
PRACH configuration	1			FR1 PRACH of				
	Initial DL BWP			DLBW				
	Dedicated DL			DLBW	/P.1.1			
BWP configuration	BWP							
2111 oomigalation	Initial UL BWP		ULBWP.0.1					
	Dedicated UL			ULBW	/P.1.1			
	BWP							
EPRE ratio of PSS to SS		-l l		_				
EPRE ratio of PBCH DM		dB	0					
EPRE ratio of PBCH to PBCH DMRS								

		T						
EPRE ratio	o of PDCCH DMRS to SSS							
EPRE ration	o of PDCCH to PDCCH DMRS							
EPRE ration	o of PDSCH DMRS to SSS							
EPRE ration	o of PDSCH to PDSCH							
EPRE ratio	o of OCNG DMRS to SSS(Note 1)							
EPRE ratio	o of OCNG to OCNG DMRS (Note							
1)	·							
N Note2		dBm/15kH		0.0				
1 voc	$N_{oc}^{ m Note2}$		-98					
$N_{oc}^{ m Note2}$	Config 1,2		-98					
TV <sub>oc</sub>	Config 3	dBm/SCS	-95					
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	8	-0.64	-Infinity	-0.64		
$\hat{E}_s/N_{oc}$		dB	8	8	-Infinity	8		
Io <sup>Note3</sup>	Config 1,2	dBm/ 9.36MHz	-64.7	-62.37	-64.7	-62.37		
10	Config 3	dBm/ 38.16MHz	-60.55	-58.66	-60.55	-58.66		
Propagation condition		-		AW	'GN			

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [282] ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = [50] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [232]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of [282] ms.

# A.6.3.1.3 Inter-frequency handover from FR1 to FR1; unknown target cell

## A.6.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements specified in clause 6.1.1.2.

## A.6.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.3.2-2, and A.6.3.1.3.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.6.3.1.3.2-1: Inter-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is	only required to be tested in one of the supported test configurations

Table A.6.3.1.3.2-2: General test parameters Inter-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions			Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-4	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random
_				access procedure.
T1		S	5	
T2		S	≤5	

Table A.6.3.1.3.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case

Parameter		Unit	Ce	ell 1	Cell 2		
Param	eter	Unit	T1	T2	T1	T2	
NR RF Channel Numbe	r			1	2	2	
Duplex mode	Config 1			FDD TDD			
Duplex mode	Config 2,3						
	Config 1				olicable		
TDD configuration	Config 2			TDDC			
	Config 3			TDDC	onf.2.1		
	Config 1				s,c = 52		
BW <sub>channel</sub>	Config 2	MHz		10: N <sub>RI</sub>	<sub>B,c</sub> = 52		
	Config 3				,c = 106		
	Config 1				s,c = 52		
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52				
	Config 3		$40: N_{RB,c} = 106$				
DRx Cycle		ms	Not Applicable				
PDSCH Reference	Config 1			SR.1.	1 FDD		
measurement channel	Config 2			SR.1.	1 TDD		
measurement channel	Config 3			SR2.1	TDD		
CORESET Reference	Config 1			CR.1.	1 FDD		
Channel	Config 2			CR.1.	1 TDD		
Channel	Config 3			CR2.1	I TDD		
OCNG Patterns				OCNG p	oattern 1		
SMTC configuration	Config 1,2			SMTC	.1 FR1		
SWITE Configuration	Config 3			SMTC	.2 FR1		
PDSCH/PDCCH	Config 1,2	kHz	15 kHz		kHz		
subcarrier spacing	Config 3	NI IZ	30 kHz				
PUCCH/PUSCH	Config 1,2	kHz		15	kHz		
subcarrier spacing	Config 3	KITZ		30			
PRACH configuration				FR1 PRACH (	configuration 1		

	Initial DL BWP			DI DV	/P.0.1				
	Dedicated DL BWP		DLBWP.1.1						
BWP	Initial UL BWP			ULBWP.0.1					
	Dedicated UL				/P.1.1				
	BWP			ULDV	/P.I.I				
EPRE ratio of PSS t									
EPRE ratio of PBCH									
EPRE ratio of PBCH									
EPRE ratio of PDCC									
	CH to PDCCH DMRS	-							
EPRE ratio of PDSC		dB		(	)				
EPRE ratio of PDSC		-							
	DMRS to SSS(Note 1)								
	6 to OCNG DMRS (Note								
1)	3 to COIVE DWING (IVOIC								
		dBm/15kH							
$N_{oc}^{ m Note2}$		Z	-98						
M Note2 Config 1	,2		-98						
$N_{oc}^{\text{Note2}}$ Config 3		dBm/SCS	-95						
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		dB	4	4	-Infinity	5			
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	5			
Config 1	Config 1,2		-67.11	-67.11	-70.05	-66.59			
Io <sup>Note3</sup>		9.36MHz dBm/							
Config 3		38.16MHz	-62.27	-62.27	-63.96	-61.92			
Propagation condition	-	AWGN							

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [282] ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [272]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of [282] ms.

# A.6.3.1.4 SA NR - E-UTRAN handover

## A.6.3.1.4.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time

periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.4-1. General test parameters are provided in Table A.6.3.1.4-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.4-3 and A.6.3.1.4-4 respectively.

Table A.6.3.1.4-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is	only required to be tested in one of the supported test configurations

Table A.6.3.1.4-2: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in
				the test
LTE RF Channel N	Number		2	1 E-UTRAN carrier frequency is
				used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement	quantity		SS-RSRP	
E-UTRAN measur	ement quantity		RSRP	
b2-Threshold1		dBm	As specified in Table	Absolute NR SS-RSRP threshold
			A.6.3.1.4-3	for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP
				threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		S	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Inf	ormation	-	Not sent	No additional delays in random
				access procedure
Time offset between	Time offset between cells		3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 9.1.2-1
				started before T2 starts
T1		S	5	
T2		S	≤5	
T3		S	1	

Table A.6.3.1.4-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter	Unit	Configuration		Cell 1	
			T1	T2	Т3
RF channel number		1, 2, 3, 4, 5, 6	1		

Daniel and a second			4 4		EDD		
Duplex mode			1, 4		FDD		
TDD O C C C			2, 3, 5, 6		TDD		
TDD Configuration	n		2, 5		TDDConf.1.1		
BW <sub>channel</sub>		MHz	3, 6	10.	TDDConf.1.2 10: N <sub>RB,c</sub> = 52 (FDD)		
DVVchannel		IVITZ	1, 4				
			2, 5 3, 6		$N_{RB,c} = 52 (TI)$		
PDSCH reference measurement			1, 4	40.	$N_{RB,c} = 106 (T$	(טט	
channel			2, 5		SR.1.1 FDD SR.1.1 TDD		
Channel			3, 6		SR.2.1 TDD		
CORSET reference	o channal		1, 4		CR.1.1 FDD		
CONSETTERETERIO	be charmer		2, 5		CR.1.1 TDD		
			3, 6		CR.2.1 TDD		
OCNG pattern <sup>Note</sup>	1		1, 2, 3, 4, 5, 6		OP.1		
OCINO pattern	Initial DL BWP		1, 2, 3, 4, 5, 6		DLBWP.0.1		
			1, 2, 3, 4, 3, 0				
	Dedicated DL BWP				DLBWP.1.1		
BWP	Initial UL BWP				ULBWP.0.1		
	Dedicated UL BWP				ULBWP.1.1		
SMTC configuration			1, 2, 3, 4, 5, 6		SMTC.1		
SSB configuration			1, 2, 4, 5		SSB.1 FR1		
Ŭ			3, 6	SSB.2 FR1			
b2-Threshold1		ır	1, 2, 4, 5	-96			
		dBm	3, 6	-93			
EPRE ratio of PSS to SSS			1, 2, 3, 4, 5, 6				
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PB0							
PBCH_DMRS							
EPRE ratio of PDO							
EPRE ratio of PD	CCH to						
PDCCH_DMRS		dB			0		
EPRE ratio of PD	SCH_DMRS to						
SSS							
EPRE ratio of PDS	SCH to						
PDSCH_DMRS	NO DAIDS : 222						
	NG DMRS to SSS						
EPRE ratio of OC	NG to OCNG						
DMRS N <sub>oc</sub> Note2		dD-m/4.5 1/1.1-	100150		100		
		dBm/15 KHz	1, 2, 3, 4, 5, 6		-100		
N <sub>oc</sub> Note2 dBm/SCS 1, 2, 4, 5 3, 6		-100 -97					
Ê <sub>s</sub> /N <sub>oc</sub>		dB	1, 2, 3, 4, 5, 6	012	0-4	0-4	
Ê <sub>s</sub> /I <sub>ot</sub> Note3		dB	1, 2, 3, 4, 5, 6	012	0-4	0-4	
SS-RSRP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	-88	-104	-104	
Io <sup>Note3</sup>			3, 6	-85	-101	-101	
		dBm/9.36 MHz	1, 2, 4, 5	-59.78	-70.59	-70.59	
		dBm/38.16	3, 6	-53.68	-64.49	-64.49	
Description and Pri		MHz	1 2 2 4 5 0		AVA/CNI		
Propagation cond			1, 2, 3, 4, 5, 6		AWGN		
Antenna Configura Correlation Matrix			1, 2, 3, 4, 5, 6		1x2 Low		
Correlation Watrix							

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.3.1.4-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	ction Cell 2			
			T1	T2	Т3	
RF channel number		1, 2, 3, 4, 5, 6		2		
Duplex mode		1, 2, 3		FDD		
		4, 5, 6		TDD		
TDD special subframe		4, 5, 6		6		
configuration <sup>Note1</sup>						
TDD uplink-downlink		4, 5, 6		1		
configuration <sup>Note1</sup>						
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> = 25			
			10 MHz: N <sub>RB,c</sub> = 50			
				20 MHz: N <sub>RB,c</sub> = 100	1	
PRACH		1, 2, 3		4		
Configuration <sup>Note2</sup>		4, 5, 6		53		
PDSCH parameters:		1, 2, 3		5 MHz: R.7 FDD		
DL Reference				10 MHz: R.3 FDD		
Measurement				20 MHz: R.6 FDD		
Channel <sup>Note3</sup>		4, 5, 6		5 MHz: R.4 TDD		
				10 MHz: R.0 TDD		
				20 MHz: R.3 TDD		
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.11 FDD			
parameters:			10 MHz: R.6 FDD			
DL Reference				20 MHz: R.10 FDD		
Measurement		4, 5, 6	5 MHz: R.11 TDD			
Channel <sup>Note3</sup>			10 MHz: R.6 TDD			
N			20 MHz: R.10 TDD			
OCNG Patterns <sup>Note3</sup>		1, 2, 3		5 MHz: OP.20 FDD		
				10 MHz: OP.10 FDD		
		4.5.0	20 MHz: OP.17 FDD			
		4, 5, 6		5 MHz: OP.9 TDD		
				10 MHz: OP.1 TDD 20 MHz: OP.7 TDD		
PBCH_RA		1, 2, 3, 4, 5, 6		ZU MINZ. OF.7 TOD		
PBCH_RB		1, 2, 3, 4, 3, 0				
PSS_RA						
SSS_RA	1					
PCFICH_RB						
PHICH_RA						
PHICH_RB	dB			0		
PDCCH_RA	ub			U		
PDCCH_RB	1					
PDSCH_RA	-					
PDSCH_RB	1					
OCNG_RA <sup>Note4</sup>						
OCNG_RB <sup>Note4</sup>	+					
N <sub>oc</sub> Note5	dBm/15kHz	1 2 2 4 5 6	-98			
Ês/Noc		1, 2, 3, 4, 5, 6	-98 -Infinity 8 78			
Ês/Noc Ês/Iot <sup>Note6</sup>	dB dB	1, 2, 3, 4, 5, 6				
RSRP <sup>Note6</sup>		1, 2, 3, 4, 5, 6	-Infinity	78	78	
SCH_RPNote6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-90	-90	
_	dBm/15kHz dBm/9MHz	1, 2, 3, 4, 5, 6	-Infinity -67.21	-90 -58.57	-90 -58.57	
Io <sup>Note6</sup>	ubili/9lvi⊓Z	1, 2, 3, 4, 5, 6	+10log(N <sub>RB,c</sub> /100)	+10log(N <sub>RB,c</sub> /100)	+10log(N <sub>RB,c</sub> /100)	
Propagation Condition		1, 2, 3, 4, 5, 6	TOOG(NKB,C/100)	AWGN	I I TOTOG(TAKB,C/ TOO)	
i ropagation Condition		1, 4, 3, 4, 5, 6		AWGIN		

Antenna Configuration			1, 2, 3, 4, 5, 6	1x2 Low			
and Corr	elation Matrix						
Note 1:	Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].						
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].							
Note 3:							
Note 4:	e 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 5:	,						
Note 6:							
Note 7:	,						

## A.6.3.1.4.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

 $T_{interrupt} = 35$  ms in the test;  $T_{interrupt}$  is defined in clause 6.1.2.1.

This gives a total of 85 ms.

# A.6.3.1.5 SA NR - E-UTRAN handover with unknown target cell

## A.6.3.1.5.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

A RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.5-1. General test parameters are provided in Table A.6.3.1.5-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.5-3 and A.6.3.1.5-4 respectively.

Table A.6.3.1.5-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE i	s only required to be tested in one of the supported test configurations

Table A.6.3.1.5-2: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel N	umber		1	1 NR carrier frequency is used in
				the test
LTE RF Channel I	Number		2	1 E-UTRAN carrier frequency is
				used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement	quantity		SS-RSRP	
E-UTRAN measur	E-UTRAN measurement quantity		RSRP	
b2-Threshold1		dBm	As specified in Table	Absolute NR SS-RSRP threshold
			A.6.3.1.5-3	for event B2
b2-Threshold2EU	TRAN	dBm	-98	Absolute E-UTRAN RSRP
				threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		S	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring In	Access Barring Information		Not sent	No additional delays in random
				access procedure
Time offset between cells			3 ms	Asynchronous cells
T1	·	S	≤5	
T2		S	1	

Table A.6.3.1.5-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Para	meter	Unit	Configuration	Cell 1		
				T1	T2	
RF channel num	ber		1, 2, 3, 4, 5, 6	1		
Duplex mode			1, 4	F	D	
			2, 3, 5, 6	TE	D	
TDD Configuration	on		2, 5	TDDC	onf.1.1	
			3, 6	TDDC	onf.1.2	
BW <sub>channel</sub>		MHz	1, 4	10: N <sub>RB,c</sub> =	: 52 (FDD)	
			2, 5	10: N <sub>RB,c</sub> =	: 52 (TDD)	
			3, 6	40: N <sub>RB,c</sub> = 106 (TDD)		
PDSCH reference	e measurement		1, 4	SR.1.	I FDD	
channel			2, 5	SR.1.	I TDD	
			3, 6	SR.2.	I TDD	
CORSET referen	ice channel		1, 4	CR.1.	1 FDD	
			2, 5	CR.1.	1 TDD	
			3, 6	CR.2.	1 TDD	
OCNG pattern <sup>Note1</sup>			1, 2, 3, 4, 5, 6	OF	P.1	
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBW	P.0.1	

	Dedicated DL BWP			DLBW	/P.1.1	
	Initial UL BWP	-		ULBW	/P.0.1	
Dedicated UL BWP				ULBW	/P.1.1	
SMTC configurat	ion		1, 2, 3, 4, 5, 6	SMT	ΓC.1	
SSB configuration			1, 2, 4, 5	SSB.		
			3, 6	SSB.2		
b2-Threshold1		dBm	1, 2, 4, 5	-9	90	
		UDIII	3, 6	-8	37	
EPRE ratio of PS	SS to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PB	CH_DMRS to					
SSS						
EPRE ratio of PB	CH to					
PBCH_DMRS		1				
EPRE ratio of PD	OCCH_DMRS to					
SSS						
EPRE ratio of PD	OCCH to					
PDCCH_DMRS		dB		(	0	
EPRE ratio of PD SSS	<del>-</del>					
EPRE ratio of PD	SCH to					
PDSCH_DMRS						
SSS	EPRE ratio of OCNG DMRS to					
EPRE ratio of OC	CNG to OCNG					
DMRS						
N <sub>oc</sub> Note2		dBm/15 KHz	1, 2, 3, 4, 5, 6		98	
N <sub>oc</sub> Note2		dBm/SCS	1, 2, 4, 5		98	
			3, 6	-95		
Ê <sub>s</sub> /N <sub>oc</sub>		dB	1, 2, 3, 4, 5, 6	0	0	
Ê <sub>s</sub> /I <sub>ot</sub> Note3		dB	1, 2, 3, 4, 5, 6	0	0	
SS-RSRP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	-98	-98	
			3, 6	-95	-95	
Io <sup>Note3</sup>		dBm/9.36	1, 2, 4, 5	-67.04	-67.04	
		MHz		22.24	00.04	
		dBm/38.16 MHz	3, 6	-60.94	-60.94	
Propagation cond	dition		1, 2, 3, 4, 5, 6	AW	GN	
Antenna Configu			1, 2, 3, 4, 5, 6		Low	
Correlation Matrix	X					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.3.1.5-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	С	Cell 2	
		<u> </u>	T1	T2	
RF channel number		1, 2, 3, 4, 5, 6	2		
Duplex mode		1, 2, 3	FDD		
•		4, 5, 6	TDD		
TDD special subframe configuration Note1		4, 5, 6	6		

TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1	
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>F</sub>	RB c = 25
		, , , , ,	10 MHz: N	
			20 MHz: N <sub>F</sub>	RB,c = 100
PRACH Configuration <sup>Note2</sup>		1, 2, 3	4	
		4, 5, 6	53	
PDSCH parameters:		1, 2, 3	5 MHz: R	.7 FDD
DL Reference Measurement			10 MHz: F	R.3 FDD
Channel <sup>Note3</sup>			20 MHz: F	
		4, 5, 6	5 MHz: R	
			10 MHz: F	
			20 MHz: F	
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.	
parameters:			10 MHz: R.6 FDD	
DL Reference Measurement			20 MHz: R	
Channel <sup>Note3</sup>		4, 5, 6	5 MHz: R.	
			10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OONO D Nete2		4.0.0		
OCNG Patterns <sup>Note3</sup>		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4.5.0		
		4, 5, 6	5 MHz: OF	
			10 MHz: O	
PBCH RA		1, 2, 3, 4, 5, 6	20 MHz: O	P.7 TUU
PBCH_RB		1, 2, 3, 4, 5, 6		
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB	dB		0	
PDCCH_RA	UD		0	
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG RA <sup>Note4</sup>				
OCNG_RB <sup>Note4</sup>				
N <sub>oc</sub> Note5	dBm/15kHz	1 2 2 1 5 6	00	
Ê <sub>s</sub> /N <sub>oc</sub>		1, 2, 3, 4, 5, 6	-98	
Ês/Iot <sup>Note6</sup>	dB dB	1, 2, 3, 4, 5, 6	-Infinity	7 7
RSRP <sup>Note6</sup>		1, 2, 3, 4, 5, 6	-Infinity	/ -91
SCH_RP <sup>Note6</sup>	dBm/15kHz dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity -Infinity	-91 -91
Io <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-infinity -70.22	-91 -62.43
	UDIII/9IVIHZ	1, 2, 3, 4, 5, 6		
Propagation Condition Antenna Configuration and		1, 2, 3, 4, 5, 6	AW(	
Correlation Matrix Note7		1, 2, 3, 4, 5, 6	1x2 L	OW
Correlation Matrix 1999				

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].

Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 6:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.1.5.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

 $T_{interrupt} = 115$  ms in the test;  $T_{interrupt}$  is defined in clause 6.1.2.1.

This gives a total of 165 ms.

# A.6.3.2 RRC Connection Mobility Control

## A.6.3.2.1 SA: RRC Re-establishment

# A.6.3.2.1.1 Intra-frequency RRC Re-establishment in FR1

## A.6.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.1.1-1, table A.6.3.2.1.1.1-2 and table A.6.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

Table A.6.3.2.1.1.1-1: Supported test configurations

Co	onfiguration	Description
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations.

Table A.6.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

	Parameter		Test	Value	Comment
			configuration		
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channe	el Number		1, 2, 3	1	
Time offse	t between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer; T310 is disabled
T311		ms	1, 2, 3	3000	RRC re-establishment timer

Access Barring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration		1	SSB.1 FR1	·
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC	
			pattern 2	
		2	SMTC	
			pattern 1	
		3	SMTC	
			pattern 1	
DRX cycle length	s	1, 2, 3	OFF	
PRACH configuration index		1, 2, 3	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1	S	1, 2, 3	5	
T2	ms	1, 2, 3	200	Time for the UE to detect RLF
T3	S	1, 2, 3	2	

Table A.6.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test		Cell 1			Cell 2	
		configuration	T1	T2	T3	T1	T2	T3
TDD configuration		1		N/A			N/A	
_		2	TDDConf.1.1				DDConf.1.	
		3	Т	DDConf.2.	1	Т	DDConf.2.	.1
PDSCH RMC		1		SR.1.1 FDD			N/A	
configuration		2		SR.1.1 TDD				
		3		SR.2.1 TDD				
RMSI CORESET		1		CR.1.1 FDD	)	(	CR.1.1 FDI	)
RMC configuration		2		CR.1.1 TDD			CR.1.1 TDI	
		3		CR.2.1 TDD			CR.2.1 TDI	
Dedicated CORESET		1		CR.1.1 FD			CR.1.1 FD	
RMC configuration		2	С	CR.1.1 TD	D	С	CR.1.1 TD	D
		3	С	CR.2.1 TD	D	С	CR.2.1 TD	D
OCNG Pattern		1, 2, 3	OP.1 d	defined in A	.3.2.1	OP.1 (	defined in A	٩.3.2.1
TRS configuration		1		RS.1.1 FDI			N/A	
		2		RS.1.1 TDI				
		3		RS.1.2 TDI				
Initial DL BWP		1, 2, 3	[	DLBWP.0.1		DLBWP.0.1		1
configuration								
Initial UL BWP		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
configuration				•				
Active DL BWP		1, 2, 3	DLBWP.	N/A	N/A	N/A	N/A	DLBW
confgiuration			1.1					P.1.1
Active UL BWP		1, 2, 3	ULBWP.	N/A	N/A	N/A	N/A	ULBW
configuration			1.1					P.1.1
RLM-RS	<u> </u>	1, 2, 3		SSB	1		SSB	
$\hat{\mathbf{E}}_{s}/\mathbf{I}_{ot}$	dB	1	1.54	-infinity	-infinity	-3.79	4	4
		2						
	ID (000	3						
$N_{oc}$ Note2	dBm/SCS	1			-98			
- · oc		2			-98			
	dBm/15 kHz	3			-95			
$N_{oc}$ Note2	abm/15 kHz	1			-98			
oc		3						
Δ /	dB	1	7	infinit.	infinity.	1 4	1	4
$\hat{E}_s/N_{oc}$	aв		/	-infinity	-infinity	4	4	4
		2						
SS-RSRP Note3	dBm/SCS	3	04	infinite :	-infinity	-94	-94	0.4
33-K3KP	ubiii/SCS	2	-91 -91	-infinity -infinity	-infinity	-94 -94	-94 -94	-94 -94
		3	-91 -88	-infinity	-infinity	-94 -91	-94 -91	-94 -91
lo	dBm/9.36 MHz	1	-88 -60.74	-infinity -64.59	-infinity -64.59	-60.74	-91 -64.59	-64.59
IU		2	-60.74 -60.74		-64.59 -64.59	-60.74		
	dBm/9.36 MHz			-64.59			-64.59	-64.59
Dronogotion	dBm/38.16 MHz	3 1, 2, 3	-54.65	-58.50	-58.50	-54.65	-58.50	-58.50
Propagation Condition		1, 2, 3			AWG	IIN		
CONTUNITION		i	I					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable

parameters themselves.

#### A.6.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than [1.6] s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish\_delay}} = T_{UL\_grant} + T_{UE\_re\text{-establish\_delay}}.$$

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{freq} = 1$ 

 $T_{identify\_intra\_NR} = 200 \ ms$ 

 $T_{SI} = [1280]$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

T<sub>PRACH</sub> = [15] ms; it is the additional delay caused by the random access procedure.

This gives a total of [1545] ms, allow [1.6] s in the test case.

## A.6.3.2.1.2 Inter-frequency RRC Re-establishment in FR1

#### A.6.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.2.1-1, table A.6.3.2.1.2.1-2 and table A.6.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

Table A.6.3.2.1.2.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell					
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD	15 kHz SSB SCS, 10 MHz bandwidth, FDD					
	duplex mode	duplex mode					
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD	15 kHz SSB SCS, 10 MHz bandwidth, TDD					
	duplex mode	duplex mode					
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD	30 kHz SSB SCS, 40 MHz bandwidth, TDD					
duplex mode duplex mode							
Note: The UE is only required to be tested in one of the supported test configurations.							

Table A.6.3.2.1.2.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1

	Parameter	Unit	Test configuration	Value	Comment
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channe	el Number		1, 2, 3	1, 2	
Time offset	t between cells		1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer; T310 is disabled
	T311		1, 2, 3	5000	RRC re-establishment timer
Access Bar	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	juration		1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC conf	figuration		1	SMTC	
			_	pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
DBV avala	longth	-	1 2 2	pattern 1 OFF	
DRX cycle	nfiguration index	S	1, 2, 3 1, 2, 3	87	The detailed configuration is specified in
	inguration index				TS 38.211 clause 6.3.3.2
T1		S	1, 2, 3	5	
T2		ms	1, 2, 3	200	Time for the UE to detect RLF
T3		S	1, 2, 3	5	

Table A.6.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test		Cell 1			Cell 2	
		configuration	T1	T1 T2 T3		T1	T2	T3
RF Channel Number		1, 2, 3		1			2	
TDD configuration		1		N/A			N/A	
		2	Т	DDConf.1.	1	Т	DDConf.1.	1
		3	Ţ	DDConf.2.	1	Т	DDConf.2.	1
PDSCH RMC		1	;	SR.1.1 FDD	)		N/A	
configuration		2	;	SR.1.1 TDD	)			
		3	;	SR.2.1 TDD	)			
RMSI CORESET		1	CR.1.1 FDD CR.1.1 FDD		)			
RMC configuration		2	CR.1.1 TDD		R.1.1 TDE	)		
		3	(	CR.2.1 TDD	)	C	R.2.1 TDE	)
Dedicated CORESET		1	C	CCR.1.1 FDD CCR.1.1		CR.1.1 FD	D	
RMC configuration		2	C	CR.1.1 TDI	)	C	CR.1.1 TD	D
		3	C	CR.2.1 TDI	)	C	CR.2.1 TD	D
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1 OP.1 defined in A.3.2				.3.2.1	
TRS configuration		1	TRS.1.1 FDD N/A					

		2	Т	RS.1.1 TDI	)					
		3		RS.1.2 TDI						
Initial DL BWP configuration		1, 2, 3	DLBWP.0 DLBWP.0							
Initial UL BWP configuration		1, 2, 3		ULBWP.0			ULBWP.0			
Active DL BWP confgiuration		1, 2, 3	DLBWP. 1.1	N/A	N/A	N/A	N/A	DLBW P.1.1		
Active UL BWP configuration		1, 2, 3	ULBWP. 1.1	N/A	N/A	N/A	N/A	ULBW P.1.1		
RLM-RS		1, 2, 3		SSB			SSB			
$\hat{E}_{s}/I_{ot}$	dB	1 2 3	4	-infinity	-infinity	-infinity	-infinity	7		
	dBm/SCS	1	1		00	1				
$N_{oc}$ Note2	ubiii/SCS	2	-98 -98							
		3		-95						
<b>1</b> 7	dBm/15 kHz	1	-98							
$N_{_{OC}}$ Note2		2	1							
		3								
$\hat{E}_{s}/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7		
s 7 0c		2								
		3								
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-91		
		2	-94	-infinity	-infinity	-infinity	-infinity	-91		
		3	-91	-infinity	-infinity	-infinity	-infinity	-88		
lo	dBm/9.36 MHz	1	-64.59	-70.048	-70.048	- 70.048	-70.048	-62.26		
	dBm/9.36 MHz	2	-64.59	-70.048	-70.048	- 70.048	-infinity	-62.26		
	dBm/38.16 MHz	3	-58.50	-66.955	-66.955	- 66.955	-infinity	-57.17		
Propagation Condition		1, 2, 3	AWGN				1			

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than [3] s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

 $T_{\text{re-establish\_delay}} \!\! = T_{UL\_grant} + T_{UE\_re\text{-establish\_delay}}.$ 

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum\nolimits_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{\text{freq}} = 2$ 

 $T_{identify\ intra\ NR} = 800\ ms$ 

 $T_{identify\ inter\ NR} = 800\ ms$ 

 $T_{SI} = [1280]$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

T<sub>PRACH</sub> = [15] ms; it is the additional delay caused by the random access procedure.

This gives a total of [2945] ms, allow [3] s in the test case.

## A.6.3.2.1.3 Intra-frequency RRC Re-establishment in FR1 without serving cell timing

#### A.6.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.3.1-1, table A.6.3.2.1.3.1-2 and table A.6.3.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

Table A.6.3.2.1.3.1-1: Supported test configurations

Co	onfiguration	Description				
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

	Parameter	Unit	Test configuration	Value	Comment
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channe			1, 2, 3	1	
Time offse	t between cells		1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	6000	Radio link failure timer configured by RLF-TimersAndConstants
T311		ms	1, 2, 3	3000	RRC re-establishment timer
Access Ba	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC con	figuration		1	SMTC	
				pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
				pattern 1	
DRX cycle		S	1, 2, 3 1, 2, 3	OFF	
	onfiguration index			87	The detailed configuration is specified in clause 6.3.3.2 of TS 38.211 [6]
T1		S	1, 2, 3	5	
T2		S	1, 2, 3	6	Time for the UE to detect RLF
T3		S	1, 2, 3	3	

Table A.6.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test		Cell 1			Cell 2		
		configuration	T1	T2	T3	T1	T2	Т3	
TDD configuration		1		N/A	•		N/A		
-		2	TDDConf.1.1			Т	DDConf.1.	.1	
		3	Т	DDConf.2.	1	Т	DDConf.2.	.1	
PDSCH RMC		1	S	R.1.1 FDD	)		N/A		
configuration		2	S	R.1.1 TDD	)	Ī			
		3	S	R.2.1 TDD	)	Ī			
RMSI CORESET		1	C	R.1.1 FDD	)	(	CR.1.1 FDI	)	
RMC configuration		2	C	R.1.1 TDD	)	(	CR.1.1 TDI	)	
_		3	C	R.2.1 TDD	)	(	CR.2.1 TDI	)	
Dedicated CORESET		1		CR.1.1 FDI			CR.1.1 FD		
RMC configuration		2		CR.1.1 TDI			CR.1.1 TD		
· ·		3		CR.2.1 TDI			CR.2.1 TD		
OCNG Pattern		1, 2, 3		defined in A			defined in A		
Initial DL BWP		1, 2, 3		DLBWP.0.1			DLBWP.0.		
configuration		, ,	525771.0.1			-			
Initial UL BWP		1, 2, 3	ULBWP.0.1			ULBWP.0.1		1	
configuration		, ,	0221111011						
RLM-RS		1, 2, 3		SSB		SSB			
$\hat{E}_{s}/I_{ot}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4	
— s / -ot		2							
		3							
M Nove	dBm/SCS	1			-98		1		
$N_{\!oc}$ Note2		2	-98						
		3			-95				
M	dBm/15 kHz	1			-98				
$N_{_{\!OC}}$ Note2		2							
		3							
$\hat{E}_{s}/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4	
- s / - · · oc		2							
		3							
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-94	
		2	-94	-infinity	-infinity	-infinity	-infinity	-94	
		3	-91	-infinity	-infinity	-infinity	-infinity	-91	
lo	dBm/9.36 MHz	1	-64.59	-infinity	-infinity	-infinity	-infinity	-64.59	
	dBm/9.36 MHz	2	-64.59	-infinity	-infinity	-infinity	-infinity	-64.59	
	dBm/38.16 MHz	3	-58.50	-infinity	-infinity	-infinity	-infinity	-58.50	
Propagation		1, 2, 3			AŴG				
Condition									

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than [2.2] s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish\_delay}} = T_{UL\_grant} + T_{UE\_re\text{-establish\_delay}}.$$

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum\nolimits_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{freq} = 1$ 

 $T_{identify\_intra\_NR} = 800 \ ms$ 

 $T_{SI} = [1280]$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

T<sub>PRACH</sub> = [15] ms; it is the additional delay caused by the random access procedure.

This gives a total of [2145] ms, allow [2.2] s in the test case.

#### A.6.3.2.2 Random Access

#### A.6.3.2.2.1 Contention based random access test in FR1 for NR standalone

#### A.6.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.1.1-1. UE capble of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.1.1-2.

Table A.6.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for NR standalone

Co	nfig	Description					
	1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
	2	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
	he UE is only re apability	equired to be tested in one of the supported test configurations depending on UE					

Table A.6.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for NR Standalone

	Parame		Unit	Test-1	Comments
SSB Configuration Config 1			SSB pattern 1 in FR1	As defined in A.3.10,	
Config 2				SSB pattern 2 in FR1	except for number of
					SSBs per SS-burst and
					SS/PBCH block index as
N 1 (00	D 00				below
Number of SS	Bs per SS	5-burst		2	Different from the definition in A.3.10
SS/PBCH bloc	sk indev			0,1	Different from the
33/F BCTT bloc	SK IIIUGX			0,1	definition in A.3.10
Duplex Mode	for Cell 2	Config 1		FDD	domination in 7 t.e. 10
z apien illeae		Config 2		TDD	
TDD Configur	ation	Config 2		TDDConf.1.2	
OCNG Pattern	Note 1	<u> </u>		OCNG pattern 1	As defined in A.3.2.1.
PDSCH paran	neters	Config 1		SR.1.1 FDD	As defined in A.3.1.1.
Note 4		Config 2		SR.2.1 TDD	
NR RF Chann	el Numbe	r		1	
EPRE ratio of	PSS to S	SS	dB		
EPRE ratio of			dB		
EPRE ratio of			dB		
EPRE ratio of			dB	0	
		o PDCCH_DMRS	dB		
EPRE ratio of			dB		
EPRE ratio of		PDSCH_DMRS	dB		
CCD with	$\hat{E}_{s}/I_{ot}$		dB	3	Power of SSB with index
SSB with index 0	$N_{oc}$	Config 1	dBm/15kHz	-98	0 is set to be above configured rsrp-
mack o	1 voc	Config 2		-101	ThresholdSSB
	$\hat{E}_s/N_{oc}$	•	dB	3	
	SS-RSR	P Note 3	dBm/ SCS	-95	
	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index
SSB with index 1	$N_{oc}$	Config 1	dBm/15kHz	-98	1 is set to be below configured rsrp-
IIIdex I	1 oc	Config 2		-101	ThresholdSSB
	$\hat{E}_s/N_{oc}$	•	dB	-17	
	SS-RSR	P Note 3	dBm/ SCS	-115	
L - Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB
Io Note 2 Config 2			-62.2/38.16MHz	index 1	
ss-PBCH-BlockPower		dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [2].	
Configured UE	E transmitt	ted power (	dBm	23	As defined in clause
$P_{\text{CMAX}, f, c}$ )					6.2.4 in TS 38.101-1.
PRACH Configuration			FR1 PRACH configuration 1	As defined in A.3.x.	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: Void

Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

#### A.6.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.6.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Subclause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

## A.6.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.6.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.6.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in subclause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

#### A.6.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### A.4.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

#### A.6.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.2.2.2.1.6 the System Simulator shall not send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

#### A.6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone

#### A.6.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.2.1-1. UE capble of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.6.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for NR standalone

	Config	Description		
	1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
	2	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note:	The UE is only required to be tested in one of the supported test configurations depending on UE capability			

Table A.6.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone

	Parame	ter	Unit	Test-1	Test-2	Comments
SSB Configu		Config 1		SSB pattern 1 in FR1	SSB pattern 1 in FR1	As defined in A.3.10, except for
		Config 2	-	SSB pattern 2 in FR1	SSB pattern 2 in FR1	number of SSBs per SS-burst and
						SS/PBCH block index as below
Number of S	SBs per SS	-burst		2	2	Different from the definition in A.3.10
SS/PBCH blo	ock index			0,1	0,1	Different from the definition in A.3.10
CSI-RS Conf	iguration	Config 1 Config 2		N/A	CSI-RS.1.1 FDD CSI-RS.2.1 TDD	As defined in A.3.1.4
Duplex Mode	for Cell 2	Config 1 Config 2		FDD TDD	FDD TDD	,
TDD Configu	ration	Config 2		TDDConf.1.2	TDDConf.1.2	
OCNG Patter	rn <sup>Note 1</sup>	Corning 2		OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH para	meters	Config 1		SR.1.1 FDD	SR.1.1 FDD	As defined in
Note 4		Config 2	_	SR.2.1 TDD	SR.2.1 TDD	A.3.1.1.
NR RF Chan	nel Number	•		1	1	
EPRE ratio o			dB			
EPRE ratio o			dB			
		PBCH_DMRS	dB			
		OMRS to SSS	dB	0	0	
		PDCCH_DMRS	dB			
		DMRS to SSS DPDSCH_DMRS	dB dB			
LFIXE TAILO O	$\hat{E}_s/I_{ot}$	F DOCT DIVING	dB	3	3	Power of SSB with
SSB with		Config 1	dBm/15kHz	-98	-98	index 0 is set to be
index 0	$N_{oc}$	Config 2		-101	-101	above configured rsrp-ThresholdSSE
	$\hat{E}_s/N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	-
	$\hat{E}_s/I_{ot}$		dB	-17	-17	Power of SSB with
SSB with index 1	$N_{oc}$	Config 1	dBm/15kHz	-98	-98	index 1 is set to be below configured
IIIGCX I	1 oc	Config 2		-101	-101	rsrp-ThresholdSSE
	$\hat{E}_s/N_{oc}$		dB	-17	-17	
	SS-RSR	P Note 3	dBm/ SCS	-115	-115	
lo Note 2		Config 1	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols withou
10 11010 2		Config 2		-62.2/38.16MHz	-62.2/38.16MHz	SSB index 1
ss-PBCH-BlockPower		dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [2].	
Configured U $P_{\mathrm{CMAX, f, c}}$ )	JE transmitt	ed power (	dBm	23	23	As defined in clause 6.2.4 in TS 38.101- 1.
PRACH Conf	figuration			FR1 PRACH configuration 2	FR1 PRACH configuration 3	As defined in A.3.8.2.
Propagation Condition			-	AWGN	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

- Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.
- Note 3: Void
- Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

#### A.6.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.6.3.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for SSB-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.6.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.6.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.6.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

## A.6.3.2.3 SA: RRC Connection Release with Redirection

# A.6.3.2.3.1 Redirection from NR in FR1 to NR in FR1

#### A.6.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

#### A.6.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.1.2-2, and A.6.3.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "RRCConnectionRelease" message containing the relevant system information of Cell 2 shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.6.3.2.3.1.2-1: Redirection from NR to NR test configurations

	Config	Description
1		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
		Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
		Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
		Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only	required to be tested in one of the supported test configurations

Table A.6.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case

Pa	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2		S	1	

Table A.6.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case

Param	otor	Unit	Се	II 1	Ce	12
		Unit	T1	T2	T1	T2
NR RF Channel Numbe			1		2	
Duplex mode	Config 1			FD		
	Config 2,3			TD Not Ann		
	Config 1			Not App		
TDD configuration	Config 2			TDDC	onf.1.1	
	Config 3			TDDC	onf.2.1	
	Config 1			10: N <sub>RE</sub>	3,c = 52	
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52			
	Config 3		40: N <sub>RB,c</sub> = 106			
	Config 1		10: N <sub>RB,c</sub> = 52			
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52			
	Config 3		40: $N_{RB,c} = 106$			
DRx Cycle		ms	Not Applicable			
	Config 1			SR.1.1	FDD	
PDSCH Reference measurement channel	Config 2			SR.1.1	TDD	
	Config 3			SR2.1	TDD	
CORESET Reference	Config 1			CR.1.1	I FDD	
Channel	Config 2			CR.1.1	TDD	

1	Config 3			CR2.1	I TDD	
OCNG Patterns				OCNG p	oattern 1	
OMTO C. C.	Config 1,2			SMTC	.1 FR1	
SMTC configuration	Config 3			SMTC	.2 FR1	
PDSCH/PDCCH	Config 1,2			15 l	kHz	
subcarrier spacing	Config 3	kHz		30 I	kHz	
PUCCH/PUSCH	Config 1,2			15 I	kHz	
subcarrier spacing	Config 3	kHz		30 I	kHz	
PRACH configuration				FR1 PRACH o	configuration 1	
BWP configuraiton	Initial DL BWP			DLBW	/P.0.1	
1	Dedicated DL BWP			DLBW	/P.1.1	
1	Initial UL BWP		ULBWP.0.1			
1	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note		dB	0			
N Note2		dBm/15kH z	-98			
N oc Config 1,2				<b>-</b> 9		
Note2 Config 3				-9	)5	
$\hat{E}_{s}/I_{ot}$		dB	4	4	-infinity	4
$\hat{E}_s/N_{oc}$		dB	4	4	-infinity	4
Config 1,2		dBm/ 9.36MHz	-67.11	-67.11	-70.05	-67.11
Config 3		dBm/ 38.16MHz	-62.27	-62.27	-63.96	-62.27
Propagation condition  Note 1: OCNG shall be	pe used such that both	- "- "- "- "	-11111	AW		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [960] ms from the beginning of time period T2. The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

 $T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$ 

where:

T<sub>RRC\_procedure\_delay</sub> = [110] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{identify-NR} = [680]$  ms in the test.

 $T_{\text{SI-NR}} = 0$  ms is assumed, since the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

 $T_{RACH} = [170]$  ms in the test.

This gives a total of [960] ms.

#### A.6.3.2.3.2 Redirection from NR in FR1 to E-UTRAN

#### A.6.3.2.3.2.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to E-UTRAN requirements specified in clause 6.2.3.2.2.

#### A.6.3.2.3.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.2.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.2.2-2, A.6.3.2.3.2.2-3 and A.6.3.2.3.2.2-4.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "RRCConnectionRelease" message containing the relevant system information of Cell 2 shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.6.3.2.3.2.2-1: Redirection from NR to E-UTRAN test configurations

Configuration	Description				
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD				
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD				
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD				
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD				
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD				
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD				
Note: The UE is					

Table A.6.3.2.3.2.2-2: General test parameters for Redirection from NR to E-UTRAN test case

Pa	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2		S	1	

Table A.6.3.2.3.2.2-3: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 1)

Parameter	Unit	Cell 1		
raidilletei	Onit	T1	T2	

RF Channel Number			1
	Config 1		FDD
Duplex mode	Config 2,3		TDD
	Config 1		Not Applicable
TDD configuration	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
	Config 1		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52
	Config 3		40: N <sub>RB,c</sub> = 106
	Config 1		10: N <sub>RB,c</sub> = 52
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52
	Config 3		40: N <sub>RB,c</sub> = 106
DRx Cycle		ms	Not Applicable
·	Config 1		SR.1.1 FDD
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD
	Config 3		SR2.1 TDD
	Config 1		CR.1.1 FDD
CORESET Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR2.1 TDD
OCNG Patterns			OCNG pattern 1
CMTC configuration	Config 1,2		SMTC.1 FR1
SMTC configuration	Config 3		SMTC.2 FR1
PDSCH/PDCCH	Config 1,2		15 kHz
subcarrier spacing	Config 3	kHz	30 kHz
PUCCH/PUSCH	Config 1,2		15 kHz
subcarrier spacing	Config 3	kHz	30 kHz
PRACH configuration			FR1 PRACH configuration 1
BWP configuraiton	Initial DL BWP		DLBWP.0.1
	Dedicated DL BWP		DLBWP.1.1
	Initial UL BWP		ULBWP.0.1
Dedicated UL BWP			ULBWP.1.1
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB	0

N oc Note2	N oc Note2		-9	98
N oc	Config 1,2		-9	98
Note2	Config 3	dBm/SCS	-6	95
$\hat{E}_{_{\!s}}/I_{_{\!ot}}$		dB 4		4
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		4	4
Io <sup>Note3</sup>	Config 1,2	dBm/ 9.36MHz	-67.11	-67.11
10	Config 3	dBm/ 38.16MHz	-62.27	-62.27
Propagati	on condition	- AWGN		GN

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.3.2.3.2.2-4: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 2)

Parameter	Unit	Configuration	Cell 2
			T1 T2
RF channel number		1, 2, 3, 4, 5, 6	2
Duplex mode		1, 2, 3	FDD
		4, 5, 6	TDD
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1
BWchannel	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c} = 25$ 10 MHz: $N_{RB,c} = 50$ 20 MHz: $N_{RB,c} = 100$
PRACH Configuration <sup>Note2</sup>		1, 2, 3	4
		4, 5, 6	53
PDSCH parameters: DL Reference Measurement Channel <sup>Note3</sup>		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD
Channel <sup>Note3</sup>		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD
OCNG Patterns <sup>Note3</sup>		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD
PBCH_RA PBCH_RB PSS_RA SSS_RA	dB	1, 2, 3, 4, 5, 6	0

PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA <sup>Note4</sup>				
OCNG_RB <sup>Note4</sup>				
N <sub>oc</sub> Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	4
Ê <sub>s</sub> /I <sub>ot</sub> Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	4
RSRP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
SCH_RP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
Io <sup>Note6</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-64.76
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
- Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 6: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

## A.6.3.2.3.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [925] ms from the beginning of time period T2. The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

 $T_{connection\_release\_redirect\_E-UTRA} = T_{RRC\_procedure\_delay} + T_{identify-E-UTRA} + T_{SI-E-UTRA} + T_{RACH},$ 

where:

 $T_{RRC\_procedure\_delay} = [110]$  ms and is specified in clause 12 in TS 38.331 [2].

 $T_{\text{identify-NR}} = \mbox{[800]} \ ms$  in the test.

 $T_{SI-NR} = 0$  ms is assumed, since the UE is provided with the SI (including MIB and all relevant SIBs) of the target E-UTRAN cell before the RRC connection is released by the old NR cell.

 $T_{RACH} = [15]$  ms in the test.

This gives a total of [925] ms.

# A.6.4 Timing

# A.6.4.1 UE transmit timing

# A.6.4.1.1 NR UE Transmit Timing Test for FR1

## A.6.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 6.4.1.1.1-1

Table A.6.4.1.1.1-1: Supported test configurations for FR1 PCell

Configuration	Description				
1	NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz				
2	NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz				
3	NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz				
Note: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability.					

For this test a single NR cell is used. Table A.6.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.6.4.1.1.1-3.

Table A.6.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
E-UTRA Channel Number		1,2,3	1	1
NR Channel Number		1,2,3	2	2
TDD configuration		1	Not Applicable TDDConf.1.1 TDDConf.1.2	
		2		
		3		
BW <sub>channel</sub>		1	10: NRB,c = 52	
	MHz	2	10: N <sub>RB,c</sub> = 52	
		3	40: N <sub>RB,c</sub> = 106	
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1,2,3	DLBWP.1.1 ULBWP.1.1	
DRx Cycle	ms	1,2,3	N/A	DRX.5 <sup>Note5</sup>
PDSCH Reference measurement channel		1	SR.1.1 FDD SR.1.1 TDD SR.2.1 TDD	
		2		
		3		
RMSI CORESET Reference Channel		1	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET Reference Channel		1	CCR.1.1 FDD	
		2	CCR.1.1 TDD CCR.2.1 TDD	
		3		

1,2   SSB.1 FR1	OCNG Patterns		1,2,3	OI	P.1
SSB configuration   3					
S	SSB configuration				
S   3   S     EPRE ratio of PSS to     SSS     EPRE ratio of PBCH     DMRS to SSS     EPRE ratio of PBCH to     PBCH DMRS     EPRE ratio of PDCCH     DMRS to SSS     EPRE ratio of PDCCH to     PDCCH DMRS     EPRE ratio of PDSCH     DMRS to SSS     EPRE ratio of PDSCH to     PDSCH     DMRS to SSS(Note 1)     EPRE ratio of OCNG     DMRS to SSS(Note 1)     EPRE ratio of OCNG to     OCNG DMRS (Note 1)     N					
EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)  A column Note Note Note Note Note Note Note Note	S		-		
SSS	EPRE ratio of PSS to		0		J
$ \begin{array}{ c c c c c c c c } \hline DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PBCH \ to \\ PBCH \ DMRS \\ \hline EPRE \ ratio \ of \ PDCCH \\ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDCCH \ to \\ PDCCH \ DMRS \\ \hline EPRE \ ratio \ of \ PDSCH \\ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \\ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \ to \\ PDSCH \\ \hline EPRE \ ratio \ of \ OCNG \\ DMRS \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OCNG \ DMRS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OCNG \ DMRS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OCNG \ DMRS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \\ OSC \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \\ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \\ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \\ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \\ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \\ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note \ 1) \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ SSS(Note $					
$\begin{array}{ c c c c c c c c }\hline EPRE \ ratio \ of \ PBCH \ to \ PBCH \ DMRS \\\hline EPRE \ ratio \ of \ PDCCH \ DMRS \ to \ SSS \\\hline EPRE \ ratio \ of \ PDCCH \ to \ PDCCH \ DMRS \\\hline EPRE \ ratio \ of \ PDSCH \ to \ $	EPRE ratio of PBCH	1			
$ \begin{array}{ c c c c c c c c } \hline {\sf PBCH  DMRS} \\ \hline {\sf EPRE  ratio  of  PDCCH} \\ \hline {\sf DMRS  to  SSS} \\ \hline {\sf EPRE  ratio  of  PDCCH  to} \\ \hline {\sf PDCCH  DMRS} \\ \hline {\sf EPRE  ratio  of  PDSCH} \\ \hline {\sf DMRS  to  SSS} \\ \hline {\sf EPRE  ratio  of  PDSCH} \\ \hline {\sf DMRS  to  SSS} \\ \hline {\sf EPRE  ratio  of  PDSCH  to} \\ \hline {\sf PDSCH} \\ \hline {\sf EPRE  ratio  of  OCNG} \\ \hline {\sf DMRS  to  SSS(Note  1)} \\ \hline {\sf EPRE  ratio  of  OCNG  to} \\ \hline {\sf OCNG  DMRS  (Note  1)} \\ \hline {\sf N_{oc}  }^{Note2} \\ \hline {\sf dBm/SCS} \\ \hline {\sf dBm/SCS} \\ \hline {\sf 1,2,3} \\ \hline {\sf 3} \\ \hline {\sf -95} \\ \hline {\sf -9$					
$ \begin{array}{ c c c c c c c c }\hline {\sf EPRE \ ratio \ of \ PDCCH} \\ {\sf DMRS \ to \ SSS} \\ \hline {\sf EPRE \ ratio \ of \ PDCCH \ to} \\ {\sf EPRE \ ratio \ of \ PDSCH} \\ {\sf DMRS \ to \ SSS} \\ \hline {\sf EPRE \ ratio \ of \ PDSCH} \\ {\sf EPRE \ ratio \ of \ PDSCH} \\ \hline {\sf EPRE \ ratio \ of \ PDSCH} \\ \hline {\sf EPRE \ ratio \ of \ OCNG} \\ {\sf EPRE \ ratio \ of \ OCNG \ to} \\ {\sf OCNG \ DMRS \ to \ SSS(Note \ 1)} \\ \hline {\sf EPRE \ ratio \ of \ OCNG \ to} \\ {\sf OCNG \ DMRS \ (Note \ 1)} \\ \hline {\sf N_{oc}} & {\sf Note2} \\ \hline {\sf AdBm/SCS} & {\sf 1,2,3} & {\sf -98} & {\sf -98} \\ \hline {\sf 3_{\ \ -95}} & {\sf -95} \\ \hline {\sf -95} \\ \hline {\sf -95} \\ \hline {\sf S_s-RSRP^{Note3}} \\ \hline {\sf Io} & {\sf 1,2,3} & {\sf 3_{\ \ 3}} \\ \hline {\sf 3_{\ \ -92}} & {\sf -92} \\ \hline {\sf Io} \\ \\ \hline {\sf Io} \\ \hline {\sf Io$					
$\begin{array}{ c c c c c c c }\hline {\rm DMRS \ to \ SSS} \\ \hline {\rm EPRE \ ratio \ of \ PDCCH \ to} \\ \hline {\rm EPRE \ ratio \ of \ PDSCH} \\ \hline {\rm DMRS \ to \ SSS} \\ \hline {\rm EPRE \ ratio \ of \ PDSCH} \\ \hline {\rm EPRE \ ratio \ of \ PDSCH} \\ \hline {\rm EPRE \ ratio \ of \ OCNG} \\ \hline {\rm EPRE \ ratio \ of \ OCNG \ to} \\ \hline {\rm DMRS \ to \ SSS(Note \ 1)} \\ \hline {\rm EPRE \ ratio \ of \ OCNG \ to} \\ \hline {\rm OCNG \ DMRS \ (Note \ 1)} \\ \hline {\rm IPRE \ ratio \ of \ OCNG \ to} \\ \hline {\rm OCNG \ DMRS \ (Note \ 1)} \\ \hline {\rm IPRE \ ratio \ of \ OCNG \ to} \\ \hline {\rm II}_{A} \\ \hline {\rm II$					
$ \begin{array}{ c c c c c c }\hline EPRE \ ratio \ of \ PDCCH \ to \ PDCCH \ DMRS \\\hline EPRE \ ratio \ of \ PDSCH \ DMRS \ to \ SSS \\\hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \\\hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS(Note 1) \\\hline EPRE \ ratio \ of \ OCNG \ to \ OCNG \ DMRS \ (Note 1) \\\hline N_{oc}^{\ \ Note2} & dBm/15 \ kHz & 1,2,3 & -98 & -98 \\\hline N_{oc}^{\ \ Note2} & dBm/SCS & 1,2 & -98 & -98 \\\hline \hat{E}_s/I_{oc} & 1,2,3 & 3 & 3 \\\hline \hat{E}_s/N_{oc} & 1,2,3 & 3 & 3 \\\hline SS-RSRP^{Note3} & dBm/SCS & 1,2 & -95 & -95 \\\hline Io^{Note3} & dBm/9.36MHz & 1,2 & -65.2 & -65.2 \\\hline \end{array} $					
$ \begin{array}{ c c c c c c c } \hline \text{PDCCH DMRS} \\ \hline \text{EPRE ratio of PDSCH} \\ \hline \text{DMRS to SSS} \\ \hline \text{EPRE ratio of PDSCH to} \\ \hline \text{EPRE ratio of OCNG} \\ \hline \text{DMRS to SSS(Note 1)} \\ \hline \hline \text{EPRE ratio of OCNG to} \\ \hline \text{OCNG DMRS (Note 1)} \\ \hline \hline N_{oc}^{\text{Note2}} & \text{dBm/15 kHz} & 1,2,3 & -98 & -98 \\ \hline N_{oc}^{\text{Note2}} & \text{dBm/SCS} & 1,2 & -98 & -98 \\ \hline 3 & -95 & -95 \\ \hline \hat{E}_s/I_{ot} & 1,2,3 & 3 & 3 \\ \hline \hat{E}_s/N_{oc} & 1,2,3 & 3 & 3 \\ \hline \hat{E}_s/N_{oc} & 1,2,3 & 3 & 3 \\ \hline \text{SS-RSRP}^{\text{Note3}} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline 1,2,3 & 3 & 3 & 3 \\ \hline \text{SS-RSRP}^{\text{Note3}} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,2 & -65.2 & -65.2 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline \text{dSCS} & 1,2,3 & 3 & 3 \\ \hline $		1			
$ \begin{array}{ c c c c c c } \hline \text{PDCCH DMRS} \\ \hline \text{EPRE ratio of PDSCH} \\ \hline \text{DMRS to SSS} \\ \hline \text{EPRE ratio of PDSCH to} \\ \hline \text{EPRE ratio of OCNG} \\ \hline \text{DMRS to SSS(Note 1)} \\ \hline \hline \text{EPRE ratio of OCNG to} \\ \hline \text{OCNG DMRS (Note 1)} \\ \hline N_{oc}^{\text{Note2}} & \text{dBm/15 kHz} & 1,2,3 & -98 & -98 \\ \hline N_{oc}^{\text{Note2}} & \text{dBm/SCS} & 1,2 & -98 & -98 \\ \hline 3 & -95 & -95 \\ \hline \hat{E}_s/I_{ot} & 1,2,3 & 3 & 3 \\ \hline \hat{E}_s/N_{oc} & 1,2,3 & 3 & 3 \\ \hline \hat{S}_s-\text{RSRP}^{\text{Note3}} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2,3 & 3 & 3 \\ \hline \text{dBm/SCS} & 1,2 & -95 & -95 \\ \hline \text{dBm/SCS} & 1,2 & -95 & -95 \\ \hline \text{dBm/SCS} & 1,2 & -65.2 & -65.2 \\ \hline \end{array}$		dB	1.2.3	0	0
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		-	, ,-		
$ \begin{array}{ c c c c c c c c } \hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS(Note 1) \ \hline EPRE \ ratio \ of \ OCNG \ to \ OCNG \ DMRS \ (Note 1) \ \hline \\ \hline N_{oc}^{\ \ \ \ Note2} \ & dBm/15 \ kHz \ & 1,2,3 \ & -98 \ & -98 \ \\ \hline N_{oc}^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $					
$ \begin{array}{ c c c c c c c c } \hline \text{PDSCH} \\ \hline \text{EPRE ratio of OCNG} \\ \hline \text{DMRS to SSS(Note 1)} \\ \hline \text{EPRE ratio of OCNG to} \\ \hline OCNG DMRS (Note 1) \\ \hline \hline N_{oc}^{\text{Note2}} & \text{dBm/15 kHz} & 1,2,3 & -98 & -98 \\ \hline N_{oc}^{\text{Note2}} & \text{dBm/SCS} & 1,2 & -98 & -98 \\ \hline \hline \delta_s/I_{oc} & 1,2,3 & 3 & 3 \\ \hline \hat E_s/N_{oc} & 1,2,3 & 3 & 3 \\ \hline \hline SS-RSRP^{\text{Note3}} & 1,2,3 & 3 & 3 \\ \hline dBm/SCS & 1,2,3 & 3 & 3 \\ \hline SS-RSRP^{\text{Note3}} & 1,2 & -95 & -95 \\ \hline 10^{\text{Note3}} & \text{dBm/9.36MHz} & 1,2 & -65.2 & -65.2 \\ \hline \end{array} $		-			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		-			
$\begin{array}{ c c c c c c c c c }\hline EPRE \ ratio \ of \ OCNG \ to \ OCNG \ DMRS \ (Note 1) \\\hline \hline $N_{oc}^{\ \ \ \ \ }$ \ Note2 & dBm/15 \ kHz & 1,2,3 & -98 & -98 \\\hline \hline $N_{oc}^{\ \ \ \ \ }$ \ Note2 & dBm/SCS & 1,2 & -98 & -98 \\\hline $\hat{E}_s/I_{ot} & 1,2,3 & 3 & 3 \\\hline $\hat{E}_s/N_{oc} & 1,2,3 & 3 & 3 \\\hline $SS-RSRP^{Note3} & dBm/SCS & 1,2 & -95 & -95 \\\hline $Io^{Note3} & dBm/9.36MHz & 1,2 & -65.2 & -65.2 \\\hline \end{array}$					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	OCNG DMRS (Note 1)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		dBm/15 kHz	1,2,3	-98	-98
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		JD /000	1,2	-98	-98
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	- · oc	dBm/SCS		-95	-95
SS-RSRPNote3         dBm/SCS         1,2         -95         -95           IoNote3         dBm/9.36MHz         1,2         -92         -92           IoNote3         dBm/9.36MHz         1,2         -65.2         -65.2	$\hat{E}_s/I_{ot}$		1,2,3	3	3
dBm/SCS         3         -92         -92           IoNote3         dBm/9.36MHz         1,2         -65.2         -65.2	$\hat{E}_s/N_{oc}$		1,2,3	3	3
Io <sup>Note3</sup> dBm/9.36MHz 1,2 -65.2 -65.2	SS-RSRP <sup>Note3</sup>	ID (000	1,2	-95	-95
15 UDITI/9.50191112 1,2 -05.2 -05.2		dBm/SCS	3	-92	-92
ID (00 (141)	Io <sup>Note3</sup>	dBm/9.36MHz	1,2	-65.2	-65.2
dBm/38.1MHz   3   -59.2   -59.2		dBm/38.1MHz	3	-59.2	-59.2
Propagation condition 1,2,3 AWGN	Propagation condition		1,2,3	AW	
SRS Config 1,2,3 Config1Note6 Config2Note6				Config1 <sup>Note6</sup>	Config2 <sup>Note6</sup>

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\alpha c}$  to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRx related parameters are given in Table A.3.3.5-1

Note 6: SRS configs are given in Table A.6.4.1.1.1-3

periodicity

Any 10 bit number

Config1 Config 2 Comments SRS-ResourceSet srs-ResourceSetId 0 0 srs-ResourceIdList 0 0 resourceType Periodic Periodic Codebook Codebook Usage SRS-Resource SRS-Resourceld 0 0 Port1 Port1 nrofSRS-Ports transmissionComb n2 n2 combOffset-n2 0 0 cyclicShift-n2 0 0 0 resourceMapping 0 startPosition resourceMapping n1 n1 nrofSymbols resourceMapping n1 n1 repetitionFactor freqDomainPosition 0 0 freqDomainShift 0 0 freqHopping sl1 sl1 c-SRS freqHopping 0 0 b-SRS freqHopping 0 0 b-hop groupOrSequenceHopping Neither Neither resourceType Periodic Periodic periodicityAndOffset-p sl1, 0 sl640, 0 Offset to align with DRx

Table A.6.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

Table A.6.4.1.1.1-4: Void

0

### A.6.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Setup NR PCell according to parameters given in Table A.6.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c\mbox{ units})$  is 25600

sequenceld

- b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.6.4.1.1.2-1

Table A.6.4.1.1.2-1: Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value		
	Test1	Test2	
15	+64*64T <sub>c</sub>	+32*64T <sub>c</sub>	
30	+32*64T <sub>c</sub>	+16*64T <sub>c</sub>	

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

## A.6.4.2 UE timer accuracy

## A.6.4.3 Timing advance

### A.6.4.3.1 SA FR1 timing advance adjustment accuracy

### A.6.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

### A.6.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.6.4.3.1.2-2, A.6.4.3.1.2-3 and A.6.4.3.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.6.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.6.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3.2.1, the UE adjusts its uplink timing at slot n+k for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

Table A.6.4.3.1.2-1: Timing advance supported test configurations

	Config	Description		
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3	•	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note:	: The UE is only required to be tested in one of the supported test configurations			

Table A.6.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command		31	$N_{TA\_new} = N_{TA\_old}$ for the purpose of
(T <sub>A</sub> ) value during T1			establishing a reference value from
			which the timing advance adjustment
			accuracy can be measured during T2
Timing Advance Command		39	$N_{TA\_new} = N_{TA\_old} + 8192 * T_c$ (based on
(T <sub>A</sub> ) value during T2			equation in clause 4.2 of TS 38.213 [3])
T1	S	5	
T2	S	5	

Table A.6.4.3.1.2-3: Cell specific test parameters for timing advance

Damare et au		Unit	To	Test1		
Par	Parameter		T1	T2		
Config 1			F	DD		
Duplex mode	Duplex mode Config 2,3		Т	DD		
	Config 1		Not A	oplicable		
TDD configuration	Config 2	-	TDDO	Conf.1.1		
	Config 3	-	TDDO	Conf.2.1		
	Config 1		10: N	RB,c = 52		
BW <sub>channel</sub>	Config 2	MHz	10: N	RB,c = 52		
	Config 3		40: N <sub>R</sub>	<sub>B,c</sub> = 106		
	Config 1		10: N	<sub>RB,c</sub> = 52		
BWP BW	Config 2	MHz	10: N	RB,c = 52		
	Config 3	-		$R_{B,c} = 106$		
DRx Cycle		ms		pplicable		
PDSCH Reference	Config 1			.1 FDD		
measurement	Config 2	-	SR.1	.1 TDD		
channel	Config 3	-	SR2	.1 TDD		
OODEOET	Config 1		CR.1	.1 FDD		
CORESET	Config 2		CR.1	CR.1.1 TDD		
Reference Channel	Config 3		CR2	CR2.1 TDD		
	Config 1,4		TRS.	1.1 FDD		
TRS configuration	Config 2,5		TRS.	TRS.1.1 TDD		
	Config 3,6		TRS.	1.2 TDD		
OCNG Patterns	<u>-</u>		OCNG	pattern 1		
SMTC	Config 1,2		SMT	C.1 FR1		
configuration	Config 3	-	SMT	C.2 FR1		
PDSCH/PDCCH	Config 1,2	kHz	15	kHz		
subcarrier spacing	Config 3	K⊓∠	30	kHz		
PUCCH/PUSCH	Config 1,2	kHz		kHz		
subcarrier spacing	Config 3	KΠZ	30	kHz		
EPRE ratio of PSS to	SSS					
EPRE ratio of PBCH	DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS		dB		0		
EPRE ratio of PDSCH DMRS to SSS		ub	0			
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note						
1)	·					

N oc Note2		dBm/15kH z	-98
N oc	Config 1,2	-ID (000	-98
Note2	Config 3	dBm/SCS	-95
$\hat{E}_s/I_{ot}$		dB	3
$\hat{E}_{s}/N_{oc}$		dB	3
IoNote3	Config 1,2	dBm/ 9.36MHz	-67.57
10.12.80	Config 3	dBm/ 38.16MHz	-62.58
Propagation	on condition	-	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

Field		Value	Comment
c-SRS	Config 1,2	12	
U-3K3	Config 3	24	Fraguency hopping is disabled
b-S	RS	0	Frequency hopping is disabled
b-h	юр	0	
freqDoma	inPosition	0	Frequency domain position of SRS
freqDom	nainShift	0	
groupOrSequ	enceHopping	neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5=0	Once every 5 slots
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
usa	ige	nonCodebook	Non-codebook based UL transmission
startPo	osition	0	resourceMapping setting. SRS on last
nrofSy	mbols	n1	symbol of slot, and 1symbols for SRS
repetitio	nFactor	n1	without repetition.
combO	ffset-n2	0	transmission Comb setting
cyclicShift-n2		0	transmissionComb setting
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further	er information see cla	.331 [2].	

### A.6.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where:

k = 4 for Config 1, 2, and

k = 7 for Config 3

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

## A.6.5 Signaling characteristics

## A.6.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power [-50] dBm (as defined in TS 38.101-1 [18]) means uplink signal
- UE output power equal to or less than Transmit OFF power [-50] dBm (as defined in TS 38.101-1 [18]) means no uplink signal.

# A.6.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

### A.6.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.1.1-1. The test parameters are given in Tables A.6.5.1.1.1-2, A.6.5.1.1.1-3, and A.6.5.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.6.5.1.1.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz			
2	TDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz			
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40 MHz			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BW <sub>channel</sub>	Config 1	MHz	10: N <sub>RB,c</sub> = 52
	Config 2		10: N <sub>RB.c</sub> = 52

		Config 3		40: N <sub>RB,c</sub> = 106	
DL initial BWP		Config 1, 2, 3		40. NRB,c = 100	
configuration		<b>3</b> , .		DLBWP.0.1	
DL dedicated BWP Configuration		Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration		Config 1, 2, 3		ULBWP.0.1	
UL dedicated B	SWP	Config 1, 2, 3		ULBWP.1.1	
configuration		0 " 1		-	
TDD Configura	tion	Config 1		Not Applicable	
		Config 2		TDDConf.1.1	
00050550		Config 3		TDDConf.2.1	
CORESET Ref	erence	Config 1		CR.1.1 FDD	
Channel		Config 2		CR.1.1 TDD	
000 0 "		Config 3		CR.2.1 TDD	
SSB Configura	tion	Config 1		SSB.1 FR1	
		Config 2		SSB.1 FR1	
01/70 0 (		Config 3		SSB.2 FR1	
SMTC Configur	ration	Config 1, 2		SMTC.1	
		Config 3		SMTC.1	
PDSCH/PDCC	H subcarrier	Config 1, 2		15 KHz	
spacing		Config 3		30 KHz	
PRACH Config	uration	Config 1, 2		Table A.3.8.2.4-1	
		Config 3		Table A.3.8.2.4-1	
SSB index assi	gned as RLM	RS		0	
OCNG parame				OP.1	
CP length				Normal	
Correlation Mat	trix and Anten	na Configuration		2x2 Low	
Out of sync	DCI format			1-0	
transmission parameters	Number of C symbols	Control OFDM		2	
	Aggregation	level	CCE	8	
	Ratio of hyp	othetical PDCCH RE	dB	4	
		erage SSS RE		·	
	Ratio of hyp	othetical PDCCH	dB	4	
	DMRS energy	gy to average SSS RE			
		oder granularity		REG bundle size	
				6	
DRX	REG bundle	3140		6 OFF	
Gap pattern ID				gp0	
Layer 3 filtering	<u> </u>			gpo Enabled	
			ma		
T310 timer			ms	0	
T311 timer			ms	1000	
N310				1	
N311 CSI-RS configuration		Config 1 4		[CSI-RS.1.3 FDD]	
Col-Ro configuration		Config 1, 4 Config 2, 5			
		Config 2, 5		[CSI-RS.1.3 TDD] [CSI-RS.2.3 TDD]	
		Config 3, 6		[CSI-RS.2.3 TDD] [TRS.1.1 FDD]	
CSI-RS for tracking					
Config 2, 5				[TRS.1.1 TDD]	
Config 3, 6				[TRS.1.2 TDD]	
T1 T2			S	0.6	
			S	0.6	
T3			S	O.U	

D1	S	0.44
Note 1: All configurations are assigned to the UE Note 2: UE-specific PDCCH is not transmitted after	•	start of time period T1.

Table A.6.5.1.1.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

	Parameter	Unit	Test 1		
			T1	T2	T3
EPRE ra	tio of PDCCH DMRS to SSS	dB		4	
EPRE ra	tio of PDCCH to PDCCH DMRS	dB		0	
EPRE ra	tio of PBCH DMRS to SSS	dB			
EPRE ra	tio of PBCH to PBCH DMRS	dB			
EPRE ra	tio of PSS to SSS	dB			
EPRE ra	tio of PDSCH DMRS to SSS	dB		0	
EPRE ra	tio of PDSCH to PDSCH DMRS	dB			
EPRE ra	tio of OCNG DMRS to SSS	dB			
EPRE ra	tio of OCNG to OCNG DMRS	dB			
SNR	Config 1	dB	1	-7	-15
	Config 2		1	-7	-15
	Config 3		1	-7	-15
$N_{oc}$	Config 1	dBm/		-98	
<sup>1</sup> V <sub>oc</sub>	Config 2	15KH		-98	
	Config 3	Z		-98	
Propagat	tion condition			C 300ns 1	
Note 1:	OCNG shall be used such that the and a constant total transmitted OFDM symbols.				
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.					er test as
Note 3:	ote 3: SNR levels correspond to the signal to noise ratio over the SSS REs.				
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1.1.1-1.					NR2 and
Note 5:					

Table A.6.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field		Test 1 Value
gap	Offset	0
Note:	Ensure that RLM RS is partially overlapped with measurement gap	

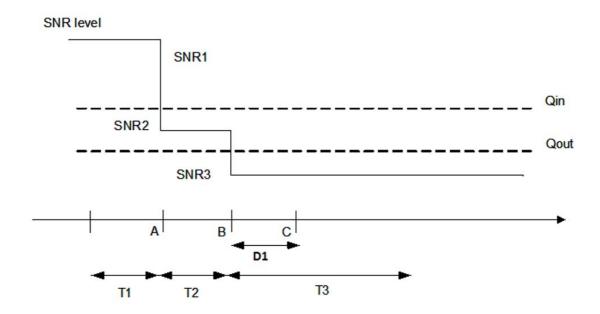


Figure A.6.5.1.1.1-1: SNR variation for out-of-sync testing

### A.6.5.1.1.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.2 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

### A.6.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.2.1-1. The test parameters are given in Tables A.6.5.1.2.1-2, and A.6.5.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.6.5.1.2.1-1: Supported test configurations for FR1 PCell

Configuration	Description		
1	FDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz		
2	TDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz		
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40 MHz		
	he UE is only required to pass in one of the supported test onfigurations in FR1		

Table A.6.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode

P	arameter	Unit	Value
Antico DOnll			Test 1
Active PCell			Cell 1
RF Channel Number	Confin 4		1
Duplex mode	Config 1		FDD
BW <sub>channel</sub>	Config 2, 3 Config 1	MHz	TDD 50
BVVchannel		IVIHZ	10: N <sub>RB,c</sub> = 52
	Config 2		10: N <sub>RB,c</sub> = 52
DL isitis I DWD	Config 3		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET Reference	Config 1		CR.1.1 FDD
Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 KHz
subcarrier spacing	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1
	Config 3		Table A.3.8.2.4-1
SSB index assigned as	S RLM RS	<u> </u>	0
OCNG parameters		1	OP.1
CP length		1	Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0

	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		[CSI-RS.1.3 FDD]
	Config 2		[CSI-RS.1.3 TDD]
	Config 3		[CSI-RS.2.3 TDD]
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]
	Config 2, 5		[TRS.1.1 TDD]
	Config 3, 6		[TRS.1.2 TDD]
T1		S	0.5
T2		S	0.4
T3		S	1.46
T4		S	0.4
T5		S	1
D1		S	0.42

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Table A.6.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
EPRE i	ratio of PDCCH DMRS to SSS	dB			4	•	•
EPRE i	ratio of PDCCH to PDCCH DMRS	dB			0		
EPRE i	ratio of PBCH DMRS to SSS	dB					
EPRE i	ratio of PBCH to PBCH DMRS	dB					
EPRE i	ratio of PSS to SSS	dB					
EPRE i	ratio of PDSCH DMRS to SSS	dB			0		
EPRE i	ratio of PDSCH to PDSCH DMRS	dB					
EPRE i	ratio of OCNG DMRS to SSS	dB					
EPRE i	ratio of OCNG to OCNG DMRS	dB					
SNR	Config 1	dB	1	-7	-15	-4.5	1
	Config 2		1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
$N_{oc}$	N Config 1		-98				
<sup>1</sup> V <sub>oc</sub>	Config 2	15		-98			
	Config 3	KHz		-98			
Propag	ation condition			TDL-C	300ns	100Hz	
Note 1:	OCNG shall be used such that the	ne resour	rces in	Cell 1	are full	y alloca	ated
	and a constant total transmitted OFDM symbols.			-			
Note 2:	Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.						
Note 3:	Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.					i.	
Note 4:	Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1,						
	SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.2.1-1.						
Note 5:	Note 5: The SNR values are specified for testing a UE which supports 2RX on at						
	least one band. For testing of a UE which supports 4RX on all bands, the						
	SNR during T3 and T4 is modified	ed as spe	cified i	n claus	se A.3.6	<del>3</del> .	

Table A.6.5.1.2.1-4: Void

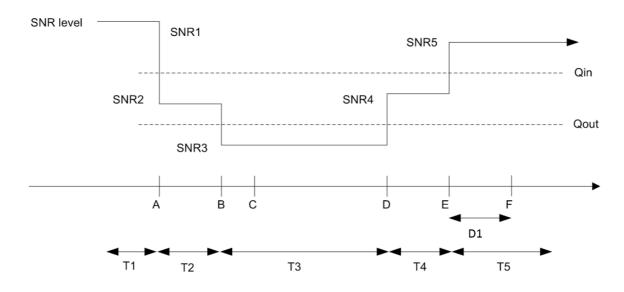


Figure A.6.5.1.2.1-1: SNR variation for in-sync testing

### A.6.5.1.2.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

### A.6.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.3.1-1. The test parameters are given in Tables A.6.5.1.3.1-2, and A.6.5.1.3.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 2.

Table A.6.5.1.3.1-1: Supported test configurations for FR1 PCell

Configuration		Description		
1		FDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz		
2		TDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz		
3		TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40 MHz		
Note: The UE is only required to pass in one of the supported test configurations in FR1		, , , , , , , , , , , , , , , , , , , ,		

Table A.6.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell	Active PCell		Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BW <sub>channel</sub>	Config 1	MHz	10: $N_{RB,c} = 52$
	Config 2		10: $N_{RB,c} = 52$
	Config 3		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1

LIL dedicated DWD	10	Ī	T
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
1DD Conniguration	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET Reference	Config 1		CR.1.1 FDD
Channel	Config 2		CR.1.1 TDD
Onamo	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
COD Comigaration	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
gg	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 KHz
subcarrier spacing	Config 3		30 KHz
, -			
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1
	Config 3		Table A.3.8.2.4-1
SSB index assigned as	RLM RS		0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		_
·	Aggregation level	CCE	8
	Ratio of hypothetical	dB	4
	PDCCH RE energy to		
	average SSS RE energy		
	Ratio of hypothetical	dB	4
	PDCCH DMRS energy		
	to average SSS RE		
	energy		
	DMRS precoder		REG bundle size
	granularity		
	REG bundle size		6
DRX Configuration			[DRX.4]
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		[CSI-RS.1.3 FDD]
	Config 2		[CSI-RS.1.3 TDD]
	Config 3		[CSI-RS.2.3 TDD]
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]
	Config 2, 5		[TRS.1.1 TDD]
T.	Config 3, 6		[TRS.1.2 TDD]
T1		S	4
T2		S	73
T3		S	73
D1		S	62.44

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1: Note 2:

Table A.6.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	Т3
EPRE rati	io of PDCCH DMRS to SSS	dB		4	
EPRE rati	io of PDCCH to PDCCH DMRS	dB		0	
EPRE rati	io of PBCH DMRS to SSS	dB			
EPRE rati	io of PBCH to PBCH DMRS	dB			
EPRE rati	io of PSS to SSS	dB		0	
EPRE rati	io of PDSCH DMRS to SSS	dB			
EPRE rati	io of PDSCH to PDSCH DMRS	dB			
EPRE rati	io of OCNG DMRS to SSS	dB			
EPRE rati	io of OCNG to OCNG DMRS	dB			
SNR	Config 1	dB	1	-7	-15
	Config 2		1	-7	-15
	Config 3		1	-7	-15
λΙ	Config 1	dBm/15	-98 -98		
$N_{\!o}$	Config 2	KHz			
	Config 3		•	-98	
Propagation condition			TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table A.6.5.1.3.1-4: Void

Table A.6.5.1.3.1-5: Void

Table A.6.5.1.3.1-6: Void

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1.3.1-1.

Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

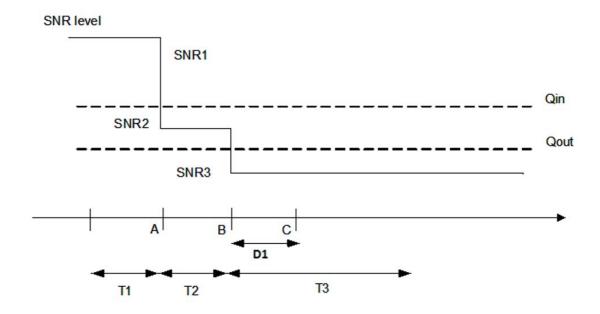


Figure A.6.5.1.3.1-1: SNR variation for out-of-sync testing

### A.6.5.1.3.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.4 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

### A.6.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.4.1-1. The test parameters are given in Tables A.6.5.1.4.1-2, and A.6.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when Onduration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.6.5.1.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz			
2	TDD, SSB SCS 15 KHz, data SCS 15 kHz, BW 10 MHz			
3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40 MHz			
	ote: The UE is only required to pass in one of the supported test configurations in FR1			

Table A.6.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode

Parameter		Unit	Value	
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
•	Config 2, 3		TDD	
BWchannel	Config 1	MHz	10: N <sub>RB,c</sub> = 52	
	Config 2		10: N <sub>RB,c</sub> = 52	
	Config 3		40: N <sub>RB,c</sub> = 106	
DL initial BWP configurati			DLBWP.0.1	
DL dedicated BWP	Config 1, 2, 3		DLBWP.1.1	
configuration				
UL initial BWP configurati	on Config 1, 2, 3		ULBWP.0.1	
UL dedicated BWP	Config 1, 2, 3		ULBWP.1.1	
configuration			ULDVVF.I.I	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference	Config 1		CR.1.1 FDD	
Channel	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.1 FR1	
	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrie			15 KHz	
spacing	Config 3		30 KHz	
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1	
	Config 3		Table A.3.8.2.4-1	
SSB index assigned as R	LM RS		0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
In sync transmission	DCI format		1-0	
parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	4	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	

	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration	•		Table A.3.3.3-1
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		[CSI-RS.1.3 FDD]
	Config 2		[CSI-RS.1.3 TDD]
	Config 3		[CSI-RS.2.3 TDD]
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]
	Config 2, 5		[TRS.1.1 TDD]
	Config 3, 6		[TRS.1.2 TDD]
T1		S	4
T2	T2		1.6
T3		S	1.36
T4		S	0.4
T5		S	1.4
D1	·	S	1

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Table A.6.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in DRX mode

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB			4		
EPRE ratio of PDCCH to PDCCH DMRS	dB			0		
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB			0		
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR Config 1	dB	1	-7	-15	-4.5	1
Config 2		1	-7	-15	-4.5	1
Config 3		1	-7	-15	-4.5	1
λ/ Config 1	dBm/15			-98		
N <sub>oc</sub> Config 1 Config 2	KHz			-98		
Config 3				-98	•	
Propagation condition		TDL-C 300ns 100Hz				
Note 1: OCNG shall be used such that the	e resources i	n Cell 1 a				otal

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.4.1-1.
- Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.

Table A.6.5.1.4.1-4: Void
Table A.6.5.1.4.1-5: Void

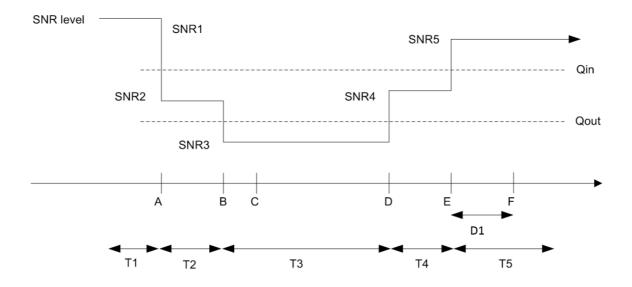


Figure A.6.5.1.4.1-1: SNR variation for in-sync testing.

### A.6.5.1.4.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.5 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

### A.6.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.5.1-1, A.6.5.1.5.1-2, A.6.5.1.5.1-3, and A.6.5.1.5.1-3A below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.5.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

Table A.6.5.1.5.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
3	TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.1.5.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
· ·	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
J	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
· · · · · · · · · · · · · · · ·	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 KHz
subcarrier spacing	9 .	-	
	Config 3		30 KHz
csi-RS-Index assigned	I as RLM RS		[0]
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE energy		
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			*[ <i>gp0</i> ]
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.2 FDD
J	Config 2	F	CSI-RS.1.2 TDD
	Config 3	F	CSI-RS.2.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.44]
	PDCCH is not transmitted after T1 sta		ניידן

Table A.6.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter Unit		Unit	Test 1		
			T1	T2	T3
PDCCH_b	eta	dB	4		
PDCCH_D	MRS_beta	dB		4	
PBCH_bet	а	dB			
PSS_beta		dB			
SSS_beta		dB		0	
PDSCH_b	eta	dB			
OCNG_be	ta	dB			
SNR	Config 1	dB	1	-7	-15
	Config 2		1	-7	-15
	Config 3	<b>T</b>	1 -7 -15		-15
λ1	Config 1	dBm/15KHz	-98		
$N_{oc}$	Config 2		-98		
Config 3			•		
Propagatio	on condition		TDL-C 300ns 100Hz		

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.5.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

	Field	
gapOffse	et	[0]
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned. (Ensure that RLM partially overlapped with m gap)	oundary RS is

# SNR 1 SNR 2 Qout SNR 3 Cell 1 SNR level

T3

#### Table A.6.5.1.5.1-4: Void

Figure A.6.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

### A.6.5.1.5.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

T2

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1 = [TBD]$  ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.6 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

### A.6.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.6.1-1, A.6.5.1.6.1-2, and A.6.5.1.6.1-3 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.6.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.6.5.1.6.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
3	TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.1.6.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value
Active PCell			Test 1
			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
-	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
· ·	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 KHz
subcarrier spacing	Config 3		30 KHz
csi-RS-Index assigned	d as RLM RS		[0]
OCNG parameters			OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0

	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310	N310		1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.2 FDD
	Config 2		CSI-RS.1.2 TDD
	Config 3		CSI-RS.2.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.24]
Note 1: UE-specific	PDCCH is not transmitted after T1	starts.	

Table A.6.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

	Parameter	Unit	Test 1					
			T1	T2	Т3	T4	T5	
PDCCH_b	eta	dB			4			
PDCCH_D	DMRS_beta	dB			4			
PBCH_bet	ta	dB						
PSS_beta		dB						
SSS_beta		dB			0			
PDSCH_b	eta	dB						
OCNG_be	ta	dB						
SNR	Config 1	dB	1	-7	-15	-4.5	1	
	Config 2		1	-7	-15	-4.5	1	
	Config 3		1	-7	-15	-4.5	1	
$N_{oc}$	Config 1	dBm/15KHz	-98 -98					
OC.	Config 2							
	Config 3		-98					
Propagatio	on condition			TD	L-C 300ns 10	0Hz		

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.6.1-4: Void

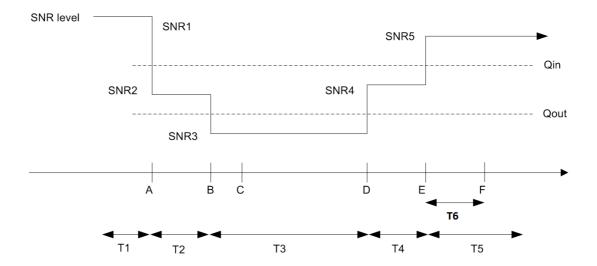


Figure A.6.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

### A.6.5.1.6.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.7 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

### A.6.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.7.1-1, A.6.5.1.7.1-2, and A.6.5.1.7.1-3 below. There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.7.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements without gaps.

Table A.6.5.1.7.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
3	TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.1.7.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in DRX mode

Parameter  Active PCell		Unit	Value
			Test 1
			Cell 1
RF Channel Number	O a wife of		1
Duplex mode	Config 1		FDD
TDD 0 " "	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 KHz
subcarrier spacing	Config 3		30 KHz
csi-RS-Index assigned	as RLM RS		[0]
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.7
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.2 FDD
<b>5</b>	Config 2		CSI-RS.1.2 TDD
	Config 3		CSI-RS.2.2 TDD

T1	S	1		
T2	S	0.4		
T3	S	[0.6]		
D1	S	[0.24]		
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table A.6.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
PDCCH_b	eta	dB		4	
PDCCH_D	MRS_beta	dB		4	
PBCH_bet	ta	dB			
PSS_beta		dB			
SSS_beta		dB	0		
PDSCH_beta		dB			
OCNG_be	ta	dB	1		
SNR	Config 1	dB	1	-7	-15
	Config 2		1	-7	-15
	Config 3		1	-7	-15
$N_{oc}$	Config 1	dBm/15KHz		-98	
- · oc	Config 2			-98	
	Config 3			-98	
Propagation	on condition			TDL-C 300ns 100Hz	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.7.1-4: Void

Table A.6.5.1.7.1-5: Void

Table A.6.5.1.7.1-6: Void

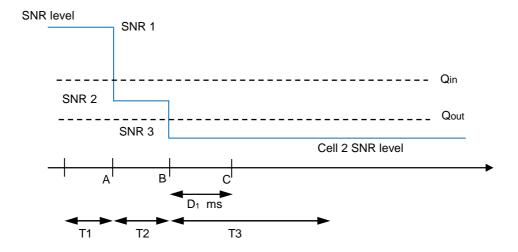


Figure A.6.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

### A.6.5.1.7.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1 = [TBD]$  ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.1.8 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

### A.6.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.8.1-1, A.6.5.1.81-2, A.6.5.1.8.1-3 and A.6.5.1.8.1-3A below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 7.

Table A.6.5.1.8.1-1: Supported test configurations for FR1 PSCell

Configuration Description				
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
3	TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.1.8.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode

	Parameter	Unit	Value	
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET	Config 1		CR.1.1 FDD	
Reference Channel	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.1 FR1	
	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2		15 KHz	
subcarrier spacing	Config 3		30 KHz	
csi-RS-Index assigned	d as RLM RS		[0]	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and	Antenna Configuration		2x2 Low	
Out of sync	DCI format		1-0	
transmission	Number of Control OFDM		2	
parameters	symbols			
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
In sync transmission	DCI format		1-0	
parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	4	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	

	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.7
Gap pattern ID			*[ <i>gp0</i> ]
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.2 FDD
	Config 2		CSI-RS.1.2 TDD
	Config 3		CSI-RS.2.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.44]
Note 1: UE-specific	PDCCH is not transmitted after T1	starts.	

Table A.6.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

	Parameter	Unit			Test 1			
			T1	T2	Т3	T4	T5	
PDCCH_b	eta	dB			4			
PDCCH_C	MRS_beta	dB			4			
PBCH_bet	ta	dB						
PSS_beta		dB						
SSS_beta		dB	0					
PDSCH_beta		dB						
OCNG_be	ta	dB	7					
SNR	Config 1	dB	1	-7	-15	-4.5	1	
	Config 2		1	-7	-15	-4.5	1	
	Config 3		1	-7	-15	-4.5	1	
λ/	Config 1	dBm/15KHz			-98			
$N_{oc}$	Config 2				-98			
	Config 3				-98			
Propagation	on condition			TD	L-C 300ns 10	0Hz		

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in non-DRX mode

	Test 8 Value	
	gapOffset	[0]
Note 1:	RLM RS is partially overlag measurement gap	oped with

Table A.6.5.1.8.1-4: Void

Table A.6.5.1.8.1-5: Void

Table A.6.5.1.8.1-6: Void

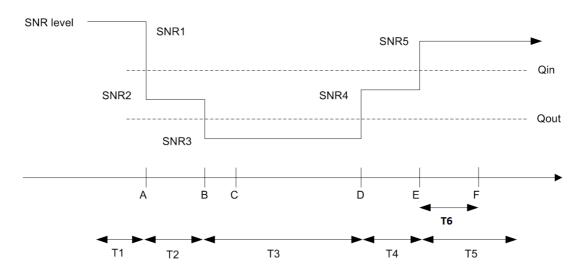


Figure A.6.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

### A.6.5.1.8.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.5.2 Interruption

### A.6.5.2.1 Interruptions during measurements on deactivated NR SCC in FR1

### A.6.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.6.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.6.5.2.1.1-2 and A 6.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector defines the start of time period T1. During T1, PCell is continuously scheduled in DL.

Table A.6.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode
3		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – FDD duplex mode
4		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode
5		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.6.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated		Cell2	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to Cell1 and Cell 2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.6.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parame	ter	Unit	Cell1	Cell2
Frequency Range	Frequency Range		FR1	FR1
Duplex mode	Config 1		FDD	FDD
	Config 2,5		TDD	TDD
	Confiq 3		TDD	FDD
	Confiq 4		FDD	TDD
TDD configuration	Config 1		Not Applicable	Not Applicable
	Config 2		TDDConf.1.1	TDDConf.1.1
	Config 3		TDDConf.1.1	Not Applicable
	Confiq 4		Not Applicable	TDDConf.1.1
	Confiq 5		TDDConf.1.2	TDDConf.1.2
BW <sub>channel</sub>	Config 1,2,3,4		10 MHz: N <sub>RB,c</sub> = 52	10 MHz: $N_{RB,c} = 52$
	Config 5		40 MHz: N <sub>RB,c</sub> = 106	40 MHz: $N_{RB,c} = 106$
Initial BWP			DLBWP.0.2 <sup>Note6</sup>	
Configuration				
PDSCH Reference Config 1			SR.1.1 FDD	SR.1.1 FDD
measurement channel Config 2			SR.1.1 TDD	SR.1.1 TDD
	Config 3		SR.1.1 TDD	SR.1.1 FDD
	Confiq 4		SR.1.1 FDD	SR.1.1 TDD

	Confiq 5		SR.2.1 TDD	SR.2.1 TDD	
RMSI CORESET Config 1			CR.1.1 FDD	CR.1.1 FDD	
parameters	Config 2	1	CR.1.1 TDD	CR.1.1 TDD	
•	Config 3		CR.1.1 TDD	CR.1.1 FDD	
	Config 4	1	CR.1.1 FDD	CR.1.1 TDD	
	Config 5		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD	
parameters	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD	
parametere	Config 3,6	1	CCR.1.1 TDD	CCR.1.1 FDD	
	Oorning 0,0	1	CCR.1.1 FDD	CCR.1.1 TDD	
		1	CCR.2.1 TDD	CCR.2.1 TDD	
OCNG Patterns			OP.1	OP.1	
SMTC Configuration			SMTC.1	SMTC.1	
SSB Configuration	Config 1 2 4 F		SSB.1 FR1	SSB.1 FR1	
SSB Configuration	Config 1,2,4,5	_			
	Config 3,6		SSB.2 FR1	SSB.2 FR1	
Correlation Matrix and Ar	ntenna		1x2 Low	1x2 Low	
Configuration					
EPRE ratio of PSS to SSS	4- 000	_			
EPRE ratio of PBCH DMRS EPRE ratio of PBCH to PBC		4			
EPRE ratio of PDCCH DMR					
EPRE ratio of PDCCH to PD		dB	0	0	
EPRE ratio of PDSCH DMR		1 45	O .	O	
EPRE ratio of PDSCH to PD					
EPRE ratio of OCNG DMRS		1			
EPRE ratio of OCNG to OCI		1			
Noc <sup>Note 2</sup>		dBm/15	[ 404]	[ 404]	
		kHz	[-104]	[-104]	
SS-RSRP Note 3		dBm/15	[ 07]	[ 0.7]	
		kHz	[-87]	[-87]	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	17	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	17	
Noc Note 2	Config 1,2,4,5	dBm/S	[-104]	[-104]	
			[-101]	[-101]	
	Config 3,6		[]	[ ]	
IoNote3	0 " 101-	dBm/	[-59]	[-59]	
-	Config 1,2,4,5	9.36MHz	[]	[]	
	0 "		[-61.9]	[-61.9]	
	Config 3,6	dBm/ 38.16MHz	[ 00]	[ 51.9]	
Time offset to cell1 Note 4		นร	33	33	
Time offset to cell2 Note 5		นร	-	3	
Propagation Condition		μδ	•		
			AWGN	AWGN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
- Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
- Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].

### A.6.5.2.1.2 Test Requirements

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on PCell shall not exceed the value defined in Table A.6.5.2.1.2-1 if the PCell is not in the same band as the deactivated SCell or Table A.6.5.2.1.2-2 if the PCell is in the same band as the deactivated SCell.

Table A.6.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length	
0	1	1	
1	0.5	1	

Table A.6.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.3 SCell Activation and Deactivation Delay

# A.6.5.3.1 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160ms SCell measurement cycle

### A.6.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.6.5.3.1.1-1 below. The test parameters are given in Tables A.6.5.3.1.1-2 and cell-specific parameters in A.6.5.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot  $(n+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ , as defined in clause 8.3. The UE shall start reporting CSI in PCell in slot  $(n+T_{HARQ}+3ms)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}+3ms+T_{SSB\_max}+T_{SMTC\_duration}])$ , as defined in clause 8.3.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in clause 8.3, and any PCell interruption due to the deactivation shall occur in the slot  $(n+1+[T_{HARQ}+3ms])$  to  $(n+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.6.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations

Config	Description	
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
Note: The UE is only required to be tested in one of the supported test configurations		

Table A.6.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channel (1, 2) are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured deactivated SCell		Cell 2	Configured deactivated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every second subframe
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on primary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell2 timing offset to cell1	μs	0	
Time alignment error between cell2 and cell1	μs	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
Т3	S	1	During this time the UE shall deactivate the SCell.
THARQ	Mslot	TBD	k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [3] depends on UE's capability
T <sub>CSI_Reporting</sub>	ms	2	the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]

Table A.6.5.3.1.1-3: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parame	Unit	T			2	T				
		<b>-</b>	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2		
Duplex mode	Config 1 Config 2,3	-			FD					
•			TDD  Not applicable							
TDD (; ;;	Config 1	_								
TDD configuration	Config 2			TDDConf.1.1						
	Config 3		TDDConf.1.2							
BWchannel	Config 1,2	MHz	10: N <sub>RB,c</sub> = 52							
	Config 3		40: N <sub>RB,c</sub> = 106							
Initial BWP configuration					DLBW	/P.0.2				
TCI state					TCI.S	tate.0				
TRS Configuration					TRS.1.	.1 TDD				
	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD			
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-		
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD			
	Config 1		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD			
Dedicated CORESET parameters	Config 2		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-		
	Config 3		CCR2.1 TDD		CCR2. 1 TDD		CCR2.1 TDD			
	Config 1		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD			
RMSI CORESET parameters	Config 2		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-		
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD			
OCNG Patterns					OF	P.1				
	onfig 1,2				SSB.2					
SMTC configuration	SMTC configuration  Config 3				SMT					
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB			(	)				
N oc Note2	Config 1,2,4,5	dBm/15KHz			-10	04				

	Config 3,6		-101
$\hat{\mathtt{E}}_{\scriptscriptstyle{\mathrm{s}}}/\mathrm{I}_{\scriptscriptstyle{\mathrm{ot}}}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5 Config 3,6	dBm/SCS	-87 -84
SCH_RP Note 3		dBm/15 kHz	-87
Propagation condition		-	AWGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

### A.6.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in a slot  $(n+T_{HARQ}+3ms)$ .

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $(n+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ ,  $T_{activation\_time}=[5 \text{ ms}+T_{SMTC\_SCell}]$ , as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot (n+ [T<sub>HARQ</sub>+3ms]), as defined in clause 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot  $(n+1+[T_{HARQ}])$  to  $(n+1+[T_{HARQ}+3ms+T_{SSB\_max}+T_{SMTC\_duration}])$ , as defined in clause 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot  $(n+1+[T_{HARQ}])$  to  $(m+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (n+T<sub>HARQ</sub>+T<sub>activation\_time</sub>+T<sub>CSI\_Reporting</sub>) as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

# A.6.5.3.2 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 320ms SCell measurement cycle

#### A.6.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1. The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.6.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-1.

Table A.6.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 320ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle (measCycleSCell)	ms	320	

#### A.6.5.3.2.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $[T_{SMTC\_MAX} + T_{SMTC\_SCell} + 5ms]$ .

## A.6.5.3.3 SCell Activation and deactivation of unknown SCell in FR1 in non-DRX

#### A.6.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.6.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.6.5.3.1.1-1. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot  $(n+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ , as defined in clause 8.3. The UE shall start reporting CSI in PCell in slot  $(n+T_{HARQ}+3ms)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}]+3ms)$ 

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in clause 8.3, and any PCell interruption due to the deactivation shall occur in the slot  $(n+1+[T_{HARQ}+3ms])$  to  $(n+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.6.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

## A.6.5.3.3.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [5 ms+2\* $T_{SMTC\_MAX}$ +2\* $T_{SMTC\_SCell}$ ] as defined in clause 8.3.

## A.6.5.4 UE UL carrier RRC reconfiguration Delay

#### A.6.5.4.1 UE UL carrier RRC reconfiguration Delay

#### Table A.6.5.4.1-1 - Table A.6.5.4.1-4: Void

### A.6.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test parameters for PCell and SCell are given in Table A. 6.5.4.1.1-1, Table A.6.5.4.1.1-2, Table A.6.5.4.1.1-3 and Table A.6.5.4.1.1-4 below. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE. At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 2 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.6.5.4.1.1-1: Supported test configurations

Configuration	PCell (Cell 1)	SCell (Cell 2)
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
2	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
3	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode
4	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
5	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
6	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode
7	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode;

		SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode						
8	30 kHz SSB SCS, 40 MHz bandwidth, TDD duple mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode						
9	30 kHz SSB SCS, 40 MHz bandwidth, TDD duple mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode						
Note:	1117.00							

Table A.6.5.4.1.1-2: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell

Parameter	Unit	Test	Value	Comment
	Offic	configuration		
RF Channel		Config 1,2,3, 4,	1, 2	Three radio channels are used for these
Number		5, 6, 7, 8, 9		two tests.
Active cell		Config 1,2,3, 4,	Cell 1: FR1 PCell	E-UTRAN PCell on RF channel number 1
		5, 6, 7, 8, 9	Cell 2: FR1 SCell	FR1 SCell on RF channel number 2
CP length		Config 1,2,3, 4,	Normal	
		5, 6, 7, 8, 9		
DRX		Config 1,2,3, 4,	OFF	
		5, 6, 7, 8, 9		
Measurement		Config 1,2,3, 4,	OFF	
gap pattern Id		5, 6, 7, 8, 9		
Filter coefficient		Config 1,2,3, 4,	0	L3 filtering is not used
		5, 6, 7, 8, 9		
T1	٠	Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T2		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T3		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		

Table A.6.5.4.1.1-3: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)

Parameter	Unit	Test		Test 1				Test 2	
		Configuration	T1	T2	Т3	3	T1	T2	T3
Channel number		Conf 1, 2, 3, 4,		2				2	
Charmernamber		5, 6, 7, 8, 9							
		Conf 1, 2, 3		N/A				N/A	
TDD configuration		Conf 4, 5, 6	TDD Conf.1.1			TDD Conf.1.1			
		Conf 7, 8, 9		TDD Conf.2				DD Conf.2	
DIA		Conf 1, 2, 3	10: N <sub>RB,c</sub> = 52			10: N <sub>RB,c</sub> = 52			
BW <sub>channel</sub>	MHz	Conf 4, 5, 6		10: N <sub>RB,c</sub> =				0: N <sub>RB,c</sub> = 3	
DDCCI L reference		Conf 7, 8, 9		$\frac{40: N_{RB,c} = 1}{SR.1.1 FD}$			40: N <sub>RB,c</sub> = 106		
PDSCH reference measurement		Conf 1, 2, 3 Conf 4, 5, 6		SR.1.1 TD				SR.1.1 FD SR.1.1 TD	
channel as defined		Conf 7, 8, 9							
in A.3.1.1		COIII 7, 0, 9		SR 2.1 TD	D		SR 2.1 TDD		
RMSI CORESET		Conf 1, 2, 3		CR.1.1 FD	D		(	CR.1.1 FD	D
reference		Conf 4, 5, 6		CR.1.1 TD				CR.1.1 TD	
measurement		Conf 7, 8, 9	J						
channel as defined in A.3.1.2			CR.2.1 TDD			(	CR.2.1 TD	D	
RMC CORESET		Conf 1, 2, 3		CCR.1.1 FE	DD		C	CR.1.1 FE	DD
reference		Conf 4, 5, 6		CCR.1.1 TE	DD		C	CR.1.1 TE	)D
measurement		Conf 7, 8, 9							
channel as defined in A.3.1.3			CCR.2.1 TDD				CCR.2.1 TDD		
OCNG Pattern Note 1		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	OP.1			OP.1			
SSB configuration		Conf 1, 2, 3, 4, 5, 6	SSB.1 FR1			SSB.1 FR1			
CCD corniguration		Conf 7, 8, 9	SSB.2 FR1			SSB.2 FR1		1	
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		SMTC.1			SMTC.1		
DL initial BWP		Conf 1, 2, 3, 4,		DLBWP.0.	1		DLBWP.0.1		1
configuration		5, 6, 7, 8, 9		DEBWY .o.	<u> </u>			DLDW1 .0.	•
DL dedicated BWP		Conf 1, 2, 3, 4,		DLBWP.1.	1			DLBWP.1.	1
configuration		5, 6, 7, 8, 9							
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		ULBWP.1.	1			ULBWP.1.	1
EPRE ratio of PSS		3, 0, 7, 0, 9							
to SSS									
EPRE ratio of									
PBCH_DMRS to									
SSS									
EPRE ratio of PBCH									
to PBCH_DMRS									
EPRE ratio of									
PDCCH_DMRS to		Conf 1 2 3 4							
SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0				0		
EPRE ratio of		5, 5, 7, 5, 5							
PDCCH to									
PDCCH_DMRS									
EPRE ratio of									
PDSCH_DMRS to									
SSS EDDE ratio of									
EPRE ratio of PDSCH to									
PDSCH to									
I DOOLI DIVINO		1							

EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		-102			-102	
Note 2	dBm/	Conf 1,2,3,4,5,6		-102			-102	
	SCS	Conf 7,8,9		-99			-99	
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_{_{\! S}}/I_{_{\!  m ot}}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1,2,3,4,5,6	-86	-86	-86	-86	-86	-86
	303	Conf 7,8,9	-83	-83	-83	-83	-83	-83
Io Note 3	dBm/ 9.36 MHz	Conf 1,2,3,4,5,6	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
10	dBm/ 38.16 MHz	Conf 7,8,9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		AWGN			AWGN	
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		1 x 2			1 x 2	

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power

spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\!\!oc}$  to be fulfilled.

NOTE 3:  $\hat{E}_{s}/I_{ot}$ , lo, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.5.4.1.1-4: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)

Parameter	Unit	Test		Test 1			Test 2		
		Configuration	T1	T2	T3	T1	T2	Т3	
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		3			3		
		Conf 1, 4, 7	N/A			N/A			
TDD configuration		Conf 2, 5, 8		TDDConf.1	.1	TDDConf.1.1			
		Conf 3, 6, 9		TDDConf.2			TDDConf.2.1		
		Conf 1, 4, 7		10: $N_{RB,c} = 5$			10: N <sub>RB,c</sub> = 52		
BW <sub>channel</sub>	MHz	Conf 2, 5, 8		10: N <sub>RB,c</sub> = 5			10: N <sub>RB,c</sub> = 52		
		Conf 3, 6, 9		40: N <sub>RB,c</sub> = 1	06 G-FR1-	4	40: N <sub>RB,c</sub> = 106	o e	
		Conf 1, 4, 7	G- FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	N/A	
PUSCH parameters for NR UL carrier		Conf 2, 5, 8	G- FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	N/A	
		Conf 3, 6, 9	G- FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	N/A	G-FR1- A3-7 in [13]	N/A	
		Conf 1, 4, 7	Table 8.3.3.1 .2-1 in [13]	Table 8.3.3.1. 2-1 in [13]	Table 8.3.3.1.2 -1 in [13]	N/A	N/A	N/A	
PUCCH parameters For NR UL carrier		Conf 2, 5, 8	Table 8.3.3.1 .2-1 in [13]	Table 8.3.3.1. 2-1 in [13]	Table 8.3.3.1.2 -1 in [13]	N/A	N/A	N/A	
		Conf 3, 6, 9	Table 8.3.3.1 .2-2 in [13]	Table 8.3.3.1. 2-2 in [13]	Table 8.3.3.1.2 -2 in [13]	N/A	N/A	N/A	
		Conf 1, 4, 7	N/A	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	
PUSCH parameters for supplementary UL		Conf 2, 5, 8	N/A	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	
		Conf 3, 6, 9	N/A	G-FR1- A3-7 in [13]	N/A	G-FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	
		Conf 1, 4, 7	N/A	N/A	N/A	Table 8.3.3.1.2 -1 in [13]	Table 8.3.3.1.2 -1 in [13]	Table 8.3.3.1.2 -1 in [13]	
PUCCH parameters for supplementary UL		Conf 2, 5, 8	N/A	N/A	N/A	Table 8.3.3.1.2 -1 in [13]	Table 8.3.3.1.2 -1 in [13]	Table 8.3.3.1.2 -1 in [13]	
		Conf 3, 6, 9	N/A	N/A	N/A	Table 8.3.3.1.2 -2 in [13]	Table 8.3.3.1.2 -2 in [13]	Table 8.3.3.1.2 -2 in [13]	
PDSCH reference		Conf 1, 4, 7		SR.1.1 FD			SR.1.1 FDD		
measurement channel as defined		Conf 2, 5, 8 Conf 3, 6, 9		<u>SR.1.1 TD</u> SR 2.1 TD			SR.1.1 TDD SR 2.1 TDD		
in A.3.1.1		Conf 1, 4, 7		CR.1.1 FD			CR.1.1 FDD		

DMCLCOPECET		040 5 0	I	OD 4 4 TO			OD 4 4 TD5		
RMSI CORESET		Conf 2, 5, 8		CR.1.1 TDI	י		CR.1.1 TDD	)	
reference		Conf 3, 6, 9							
measurement				CR.2.1 TDI	)		CR.2.1 TDD	)	
channel as defined									
in A.3.1.2		0		200 4 4 50	- D	CCR.1.1 FDD			
RMC CORESET		Conf 1, 4, 7		CCR.1.1 FD					
reference		Conf 2, 5, 8	(	CCR.1.1 TD	טי	(	CCR.1.1 TDI	ט	
measurement		Conf 3, 6, 9			_	_		_	
channel as defined				CCR.2.1 TD	טי		CCR.2.1 TDI	ט	
in A.3.1.3		0 (4 0 0	05.				00.4		
OCNG Pattern Note 1				OP.1			OP.1		
005 # #		Conf 1, 2, 4, 5,		SSB.1 FR	I		SSB.1 FR1		
SSB configuration		7,8		000 0 50			000 0 504		
		Conf 3, 6, 9		SSB.2 FR			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4,		SMTC.1			SMTC.1		
_		5, 6, 7, 8, 9							
DL initial BWP		Conf 1, 2, 3, 4,		DLBWP.0.	1		DLBWP.0.1		
configuration		5, 6, 7, 8, 9							
DL dedicated BWP		Conf 1, 2, 3, 4,		DLBWP.1.	1		DLBWP.1.1		
configuration		5, 6, 7, 8, 9							
UL dedicated BWP		Conf 1, 2, 3, 4,		ULBWP.1.	1		ULBWP.1.1		
configuration		5, 6, 7, 8, 9							
EPRE ratio of PSS									
to SSS									
EPRE ratio of									
PBCH_DMRS to									
SSS									
EPRE ratio of PBCH									
to PBCH_DMRS									
EPRE ratio of									
PDCCH_DMRS to									
SSS									
EPRE ratio of									
PDCCH to	4D	Conf 1, 2, 3, 4,		0			0		
PDCCH_DMRS	dB	5, 6, 7, 8, 9		0			0		
EPRE ratio of									
PDSCH_DMRS to									
SSS EDDE ratio of									
EPRE ratio of									
PDSCH to									
PDSCH_DMRS									
EPRE ratio of OCNG DMRS to									
SSS DIVIRS TO									
EPRE ratio of OCNG to OCNG									
DMRS									
טווואוט	dBm /	Conf 1, 2, 3, 4,							
	15kHz	5, 6, 7, 8, 9		-102			-102		
3.7		Conf 1, 2, 4, 5,							
TV Note 2 UDIII/ 7.9			-102			-102			
	SCS	Conf 3, 6, 9	-99				-99		
♠ /xx		Conf 1, 2, 3, 4,							
$\hat{E}_s/N_{oc}$	dB	5, 6, 7, 8, 9	16	16	16	16	16	16	
		Conf 1, 2, 3, 4,							
$\hat{ extbf{E}}_{ ext{s}}/ extbf{I}_{ ext{ot}}$ Note 3	dB	5, 6, 7, 8, 9	16	16	16	16	16	16	
5, 55		Conf 1, 2, 4, 5,							
SS-RSRP Note 3	dBm/	7,8	-86	-86	-86	-86	-86	-86	
00 10101	SCS	Conf 3, 6, 9	-83	-83	-83	-83	-83	-83	
	1								

Io Note 3	dBm/ 9.36 MHz	Conf 1, 2, 4, 5, 7,8	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
10	dBm/ 38.16 MHz	Conf 3, 6, 9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		AWGN			AWGN	
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		1 x 2			1 x 2	

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_o$  to be fulfilled.

NOTE 3:  $\hat{E}_{_{\! S}}/I_{_{\! ot}}$ , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within [20]ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within [20]ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within [20]ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within [20]ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

#### A.6.5.4.2 Void

## A.6.5.5 Beam Failure Detection and Link recovery procedures

# A.6.5.5.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

## A.6.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.1.1-1, A.6.5.5.1.1-2, A.6.5.5.1.1-3 and A.6.5.5.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.6.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of

the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.6.5.5.1.1-1: Supported test configurations for FR1 PCell

Configuration	Description				
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth				
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth				
3	TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth				
Note: The UE is only required to pass in one of the supported test configurations in FR1					

Table A.6.5.5.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Astina DOCall			0 - 11 4	
Active PSCell			Cell 1	
RF Channel Number	Cartin 4 4		1	
Duplex mode	Config 1, 4		FDD	
D\A/ah an a al	Config 2, 3, 5, 6	N 41 1-	TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
_	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
CORESET Reference Channel	Config 1, 4		CR. 1.1 FDD	
	Config 2, 5		CR. 1.1 TDD	
	Config 3, 6		CR. 2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	
-	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
	Config 3, 6	1	SMTC.1	
PDSCH/PDCCH subcarrier	Config 1, 2, 4, 5		15 KHz	
spacing	Config 3, 6		30 KHz	
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1	
	Config 3, 6		Table A.3.8.2.4-1	
SSB Index assigned as BFD RS	(q <sub>0</sub> )		0	

SSB Index assigned as CBD RS (q <sub>1</sub> )  OCNG parameters  CP length  Correlation Matrix and Antenna Configuration  Beam failure detection transmission parameters  Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size  DRX  Gap pattern ID  rlmInSyncOutOfSyncThreshold  PowerControlOffsetSS  dBm  dBm  config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  T1  Table  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6  Config 3, 6	1 OP.1 Normal 2x2 Low 1-0 2 8 0  REG bundle size 6 OFF gp0 absent  [-96] db0	When the field is absent, the UE applies the value 0. (Table 8.1.1-1). The hold used for O
CP length Correlation Matrix and Antenna Configuration  Beam failure detection transmission parameters    DCI format	Normal 2x2 Low  1-0 2 8 0  REG bundle size 6 OFF gp0 absent  [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
Correlation Matrix and Antenna Configuration  Beam failure detection transmission parameters    DCI format	2x2 Low  1-0 2 8 0  REG bundle size 6 OFF gp0 absent  [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
Beam failure detection transmission parameters    DCI format	1-0 2 8 0  REG bundle size 6 OFF gp0 absent [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
transmission parameters    Number of Control OFDM symbols   Aggregation level   CCE   Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy   DMRS precoder granularity   REG bundle size	8 0 0 REG bundle size 6 OFF gp0 absent [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
OFDM symbols Aggregation level CCE Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size  DRX Gap pattern ID rlmlnSyncOutOfSyncThreshold  rsrp-ThresholdSSB  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration Config 1, 4 Config 2, 5 Config 3, 6  CSI-RS for tracking Config 1, 4 Config 2, 5 Config 3, 6  CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6 CSI-RS configuration Config 3, 6 CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6	8 0 0 REG bundle size 6 OFF gp0 absent [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size  DRX  Gap pattern ID rlmlnSyncOutOfSyncThreshold  rsrp-ThresholdSSB  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration  Config 1, 4 Config 2, 5 Config 3, 6  CSI-RS for tracking Config 1, 4 Config 2, 5 Config 3, 6  CSI-RS for tracking Config 3, 6  CSI-RS for tracking Config 3, 6 CSI-RS for tracking Config 3, 6	0  REG bundle size  6  OFF  gp0  absent  [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size  DRX  Gap pattern ID rlmlnSyncOutOfSyncThreshold  rsrp-ThresholdSSB  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 3, 6  Config 3, 6	0  REG bundle size  6  OFF  gp0  absent  [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity  REG bundle size  DRX  Gap pattern ID rlmInSyncOutOfSyncThreshold  rsrp-ThresholdSSB  dBm  powerControlOffsetSS  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 1, 4  Config 2, 5  Config 3, 6	REG bundle size  6 OFF gp0 absent  [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
granularity REG bundle size  DRX  Gap pattern ID rlmInSyncOutOfSyncThreshold  rsrp-ThresholdSSB  powerControlOffsetSS  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 1, 4  Config 2, 5  Config 2, 5  Config 3, 6	6 OFF gp0 absent	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
DRX Gap pattern ID rlmInSyncOutOfSyncThreshold  rsrp-ThresholdSSB  powerControlOffsetSS  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 1, 4  Config 2, 5  Config 3, 6	OFF gp0 absent [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
Gap pattern ID rlmInSyncOutOfSyncThreshold  rsrp-ThresholdSSB  powerControlOffsetSS  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration  Config 1, 4  Config 2, 5  Config 3, 6  CSI-RS for tracking  Config 1, 4  Config 2, 5  Config 2, 5  Config 3, 6	gp0 absent [-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
rsrp-ThresholdSSB dBm  powerControlOffsetSS  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration Config 1, 4	absent	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
rsrp-ThresholdSSB dBm  powerControlOffsetSS  beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration Config 1, 4	[-96]	absent, the UE applies the value 0. (Table 8.1.1-1). Threshold used
beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration		
beamFailureInstanceMaxCount  beamFailureDetectionTimer  CSI-RS configuration	db0	for Q <sub>out_LR_SSB</sub>
beamFailureDetectionTimer  CSI-RS configuration Config 1, 4 Config 2, 5 Config 3, 6 CSI-RS for tracking Config 1, 4 Config 2, 5 Config 3, 6		Used for deriving rsrp- ThresholdCSI-RS
CSI-RS configuration Config 1, 4 Config 2, 5 Config 3, 6 CSI-RS for tracking Config 1, 4 Config 2, 5 Config 2, 5 Config 3, 6	n2	see clause 5.17 of TS 38.321 [7]
Config 2, 5 Config 3, 6 CSI-RS for tracking Config 1, 4 Config 2, 5 Config 3, 6	pbfd4	see clause 5.17 of TS 38.321 [7]
Config 3, 6 CSI-RS for tracking Config 1, 4 Config 2, 5 Config 3, 6	[CSI-RS.1.3 FDD]	
CSI-RS for tracking Config 1, 4 Config 2, 5 Config 3, 6	[CSI-RS.1.3 TDD]	
Config 2, 5 Config 3, 6	[CSI-RS.2.3 TDD]	
Config 3, 6	[TRS.1.1 FDD]	
	[TRS.1.1 TDD]	
T1 s	[TRS.1.2 TDD]	
	1	During this time the the UE shall be fully synchronized to cell 1
T2 s		
T3 s	0.4	
T4 s	0.4 [0.6]	1
T5 s		
D1 s	[0.6]	
Note 1: All configurations are assigned to the UE prior to the Note 2: UE-specific PDCCH is not transmitted after T1 star	[0.6] [0.4] [1.4] [0.44]	

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.6.5.5.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Pa	rameter	Unit	Test 1		Test 1							
				SSB of set q₀			SS	SB of set	<b>q</b> 1			
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ratio	of PDCCH	dB										
DMRS to S	SSS											
EPRE ratio	o of PDCCH to	dB										
PDCCH D	MRS											
EPRE ratio		dB										
DMRS to S	SSS											
	o of PBCH to	dB										
PBCH DM	RS				0					0		
EPRE ratio	o of PSS to SSS	dB										
	o of PDSCH	dB										
DMRS to S	SSS											
	o of PDSCH to	dB										
PDSCH D	MRS											
EPRE ratio	o of OCNG	dB										
DMRS to S	SSS											
SNR	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
L	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
$N_{oc}$	Config 1	dBm/15		•	-98		•		•	-98		
¹ 'oc	Config 2	KHz			-98					-98		
	Config 3			-98		-98						
Propagation	on condition			T	DLC300-	100			TE	DLC300-1	00	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.5.1.1-4: Measurement gap configuration for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Field	Test 2
rieid	Value
gapOffset	[0

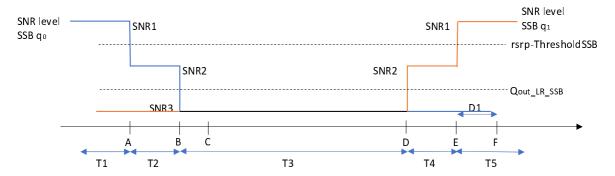


Figure A.6.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.6.5.5.1.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.5.5.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

#### A.6.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.2.1-1, A.6.5.5.2.1-2, A.6.5.5.2.1-3, A.6.5.5.2.1-4 and A.6.5.5.2.1-5 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.2.1-1 shows the variation of the downlink SNR of the SSB in set q<sub>0</sub> in the active cell to emulate SSB based beam failure. Figure A.6.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set q<sub>1</sub> of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing

alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.6.5.5.2.1-1: Supported test configurations for FR1 PCell

Co	nfiguration	Description				
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth				
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth				
3		TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth				
Note:	Note: The UE is only required to pass in one of the supported test configurations in FR1					

Table A.6.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment	
			Test 1		
Active PSCell			Cell 1		
RF Channel Number			1		
Duplex mode	Config 1, 4		FDD		
	Config 2, 3, 5, 6		TDD		
BWchannel	Config 1, 4	MHz	10: NRB,c = 52		
	Config 2, 5		10: NRB,c = 52		
	Config 3, 6		40: NRB,c = 106		
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1		
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1		
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1		
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1		
TDD Configuration	Config 1, 4		Not Applicable		
122 comigaration	Config 2, 5	1	TDDConf.1.1		
	Config 3, 6	1	TDDConf.1.2		
CORESET Reference	Config 1, 4		CR. 1.1 FDD		
Channel	Config 2, 5		CR. 1.1 TDD		
	Config 3, 6		CR. 2.1 TDD		
SSB Configuration	Config 1, 4		SSB.1 FR1		
garanen	Config 2, 5		SSB.1 FR1		
	Config 3, 6		SSB.2 FR1		
SMTC Configuration	Config 1, 2, 4,		SMTC.1		
	Config 3, 6	1	SMTC.1		
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz		
	Config 3, 6	1	30 KHz		
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1		

	Config 3, 6		Table A.3.8.2.4-1	
000 ladas assistante	<u> </u>			
SSB Index assigned as SSB Index assigned as			0	
OCNG parameters	S CDD K3 (41)		OP.1	
CP length Correlation Matrix and	Antonno		Normal 2x2 Low	
Configuration Matrix and	Antenna		ZXZ LOW	
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols		2	
parameters	Aggregation level	CCE	8	
parameters	Ratio of hypothetical	dB	0	
	PDCCH RE energy	αD	· ·	
	to average CSI-RS			
	RE energy			
	Ratio of hypothetical	dB	0	
	PDCCH DMRS	uБ	O O	
	energy to average			
	CSI-RS RE energy			
	DMRS precoder		REG bundle size	
	granularity		TALO Buridio 3120	
	REG bundle size		6	
DRX	TREO BUILDIO GIEG		DRX.7	A.3.3.7
Gap pattern ID			gp0	71.0.0.7
rlmInSyncOutOfSyncT	hreshold		absent	When the field is
Tilling ynoo dtoroynon	moonoid		aboont	absent, the UE
				applies the value
				0. (Table 8.1.1-
				1).
rsrp-ThresholdSSB		dBm	[-96]	Threshold used
•				for Qout_LR_SSB
powerControlOffsetSS			db0	Used for deriving
•				rsrp-
				ThresholdCSI-
				RS
beamFailureInstanceM	laxCount		n2	see clause 5.17
				of TS 38.321 [7]
beamFailureDetection <sup>-</sup>	Timer		pbfd4	see clause 5.17
				of TS 38.321 [7]
CSI-RS configuration	Config 1, 4		[CSI-RS.1.3 FDD]	
	Config 2, 5		[CSI-RS.1.3 TDD]	
	Config 3, 6		[CSI-RS.2.3 TDD]	
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]	
	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
T1		S	1	During this time
				the the UE shall
				be fully
				synchronized to
T0			0.1	cell 1
T2		S	0.4	
T3		S	[0.6]	
T4		S	[0.4]	
T5		S	[1.4]	
		_	I [O 4.4]	i e
D1		S	[0.44]	<u> </u>
Note 1: All configurati	ons are assigned to the DCCH is not transmitted	UE prior	to the start of time per	l riod T1.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.6.5.5.2.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Par	rameter	Unit	Test 1		Test 1							
			SSB of set q₀						SS	B of set	<b>q</b> 1	
			T1	T2	T3	T4	T5	T1	T2	Т3	T4	T5
EPRE ratio of DMRS to SS		dB										
EPRE ratio of PDCCH DM	of PDCCH to RS	dB										
EPRE ratio of to SSS	of PBCH DMRS	dB										
EPRE ratio of PBCH DMR		dB			0					0		
EPRE ratio	of PSS to SSS	dB										
EPRE ratio of DMRS to SS		dB										
EPRE ratio of PDSCH DMI	of PDSCH to RS	dB										
EPRE ratio of to SSS	of OCNG DMRS	dB										
SNR	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
$N_{oc}$	Config 1	dBm/15K	_		-98				-	-98		
oc	Config 2	Hz			-98					-98		
Config 3					-98			-98				
Propagation	condition			Т	DLC300-	100		TDLC300-100				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.5.2.1-4: Measurement gap configuration for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Field	Test 2
rieid	Value
gapOffset	[0

Table A.6.5.5.2.1-5: Void

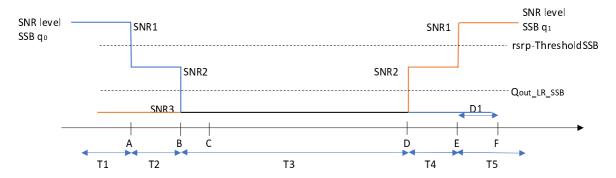


Figure A.6.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.6.5.5.2.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.5.3 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.6.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.3.1-1, A.6.5.5.3.1-2, and below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.6.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.6.5.5.3.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth			
3	TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth			
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.5.3.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value Test 1	Comment
Active PCell	Active PCell		Cell 1	
RF Channel Nu	mber		1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.1.2	
CORESET	Config 1		CR.1.1 FDD	A.3.1.2
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.1 FR1	A.3.10
Configuration	Config 2		SSB.1 FR1	
<b>3</b>	Config 3		SSB.2 FR1	
SMTC	Config 1, 2		SMTC.1	A.3.11
Configuration	Config 3		SMTC.1	71.0.11
PDSCH/PDC	Config 1, 2		15 KHz	
CH subcarrier				
spacing	Config 3		30 KHz	
csi-RS-Index as failure detection	ssigned as beam		[0]	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	7
Correlation Mat	rix and Antenna		2x2 Low	
Configuration				
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols		_	
parameters	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
csi-RS-Index as beam detection	ssigned as candidate RS in set q <sub>1</sub>		1	N

rlmInSyncO	OutOfSyncThreshold		absent	When the field is
				absent, the UE
				applies the value 0.
	- L-IOOD	.ID	[ 0.4 5]	(Table 8.1.1-1).
rsrp-Thresh	101022R	dBm	[-94.5]	Threshold used for
			-11- 0	Qin_LR_SSB
powerCont	rolOffsetSS		db0	Used for deriving
				rsrp-ThresholdCSI-
			0	RS 5.47.4
beamFailui	reInstanceMaxCount		n2	see clause 5.17 of
			1.614	TS 38.321 [7]
beamFailui	eDetectionTimer		pbfd4	see clause 5.17 of
001.00			001 00 4 0 500	TS 38.321 [7]
CSI-RS	Config 1	4	CSI-RS.1.2 FDD	A.3.14
configura	Config 2	_	CSI-RS.1.2 TDD	
tion	Config 3		CSI-RS.2.2 TDD	
TRS	Config 1		TRS.1.1 FDD	
configura	Config 2		TRS.1.1 TDD	
tion	Config 3		TRS.1.2 TDD	
T1		S	1	During this time the
				the UE shall be
				fully synchronized
				to cell 1
T2		S	0.4	
T3		S	[0.6]	
T4		S	[0.4]	
T5		S	[1.4]	
D1		S	[0.24]	
Note 1:	UE-specific PDCCH is not to	ansmitted aft	ter T1 starts.	•

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.6.5.5.3.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit			Test 1			Test 2				
			CSI	-RS of se	t qo			CSI	-RS of se	et q <sub>1</sub>	
		T1	T2	T3	T4	T5	T1	T2	Т3	T4	T5
EPRE ratio of PSS to SSS	dB										
EPRE ratio of PBCH DMRS to SSS	dB										
EPRE ratio of PBCH to PBCH DMRS	dB										
EPRE ratio of PDCCH DMRS to SSS	dB			0					0		
EPRE ratio of PDCCH DMRS	dB			0					0		
EPRE ratio of PDSCH DMRS to SSS	dB										
EPRE ratio of PDSCH DMRS	dB										

EPRE ra	tio of OCNG	dB										
DMRS to	SSS(Note											
1)												
EPRE rat	tio of OCNG	dB										
to OCNG	DMRS											
(Note 1)												
SNR_C	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
SI-RS	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
λ7	Config 1	dBm/			-98					-98		
$N_{oc}$	Config 2	15K			-98					-98		
	Config 3	Hz		-98				-98				
Propagat	ion			TDL-0	C 300ns 1	100Hz			TDL-0	C 300ns 1	00Hz	
condition												

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.5.5.3.1-4: Void

Table A.6.5.5.3.1-5: Void

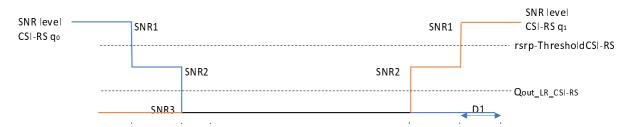


Figure A.6.5.3.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

## A.6.5.5.3.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.5.5.4 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.6.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.4.1-1, A.6.5.5.4.1-2, A.6.5.5.4.1-3, and A.6.5.5.4.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.4.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.6.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.6.5.5.4.1-1: Supported test configurations for FR1 PCell

Co	onfiguration	Description					
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth					
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth					
3		TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth					
Note:	Note: The UE is only required to pass in one of the supported test configurations in FR1						

Table A.6.5.5.4.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

P	arameter	Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Num	nber		1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.1.2	
CORESET	Config 1		CR.1.1 FDD	A.3.1.2
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.1 FR1	A.3.10
Configuration	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC	Config 1, 2		SMTC.1	A.3.11
Configuration	Config 3		SMTC.1	
PDSCH/PDCC	Config 1, 2		15 KHz	
H subcarrier	H subcarrier		30 KHz	
spacing Config 3		<u> </u>	30 KHZ	
csi-RS-Index ass	igned as beam failure		[0]	
detection RS in s	et q <sub>0</sub>			

Correlation Matrix and Antenna   Correlation Matrix and Antenna   Correlation Matrix and Antenna   Configuration	OCNG parameter	re		OP.1	A.3.2.1
Correlation Matrix and Antenna   Configuration   Configuration   DCI format   1-0   Number of Control   Control		10			71.0.2.1
DCI format detection transmission parameters		, and Δntenna			
Beam failure detection transmission parameters		Caria / interina		ZXZ LOW	
Detection transmission parameters		DCI format		1-0	
Transmission parameters					
Parameters				_	
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy   REG bundle size CSI-RS RE energy   DMRS precoder granularity   REG bundle size   DRX.7   A.3.3.7		CCF	8		
PDCCH RE energy to average CSI-RS RE energy		Ratio of hypothetical			
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size   DRX.7					
energy					
PDCCH DMRS energy to average   CSI-RS RE energy		energy			
PDCCH DMRS energy to average   CSI-RS RE energy		Ratio of hypothetical	dB	0	
energy to average   CSI-RS RE energy   DMRS precoder   granularity   REG bundle size   G   DRX   REG bundle size   G   DRX.7   A.3.3.7				Ů	
CSI-RS RE energy					
DMRS precoder granularity   REG bundle size   6					
Granularity   REG bundle size   6   DRX   DRX.7   A.3.3.7		DMRS precoder		REG bundle size	
REG bundle size					
Cap pattern ID				6	
csi-RS-Index assigned as candidate beam detection RS in set q1         21         N           rImInSyncOutOfSyncThreshold         absent         When the field is absent, the UE applies the value 0. (Table 8.1.1-1).           rsrp-ThresholdSSB         dBm         [-96]         Threshold used for Qin_LR_SSB           powerControlOffsetSS         db0         Used for deriving rsrp-ThresholdCSI-RS           beamFailureInstanceMaxCount         [n2]         see clause 5.17 of TS 38.321 [7]           beamFailureDetectionTimer         [pbfd4]         see clause 5.17 of TS 38.321 [7]           CSI-RS         Config 1         CSI-RS.1.2 FDD CSI-RS.1.2 FDD CSI-RS.1.2 TDD CSI-RS.2.2 TDD         A.3.14           TRS         Config 2         TRS.1.1 FDD CSI-RS.1.2 TDD TDD         TRS.1.1 TDD TRS.1.1 FDD TSI.1 TDD TSI.1 TRS.1.1 TDD TSI.1 TRS.1.2 TDD TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1	DRX	•		DRX.7	A.3.3.7
csi-RS-Index assigned as candidate beam detection RS in set q1         21         N           rImInSyncOutOfSyncThreshold         absent         When the field is absent, the UE applies the value 0. (Table 8.1.1-1).           rsrp-ThresholdSSB         dBm         [-96]         Threshold used for Qin_LR_SSB           powerControlOffsetSS         db0         Used for deriving rsrp-ThresholdCSI-RS           beamFailureInstanceMaxCount         [n2]         see clause 5.17 of TS 38.321 [7]           beamFailureDetectionTimer         [pbfd4]         see clause 5.17 of TS 38.321 [7]           CSI-RS         Config 1         CSI-RS.1.2 FDD CSI-RS.1.2 FDD CSI-RS.1.2 TDD CSI-RS.2.2 TDD         A.3.14           TRS         Config 2         TRS.1.1 FDD CSI-RS.1.2 TDD TDD         TRS.1.1 TDD TRS.1.1 FDD TSI.1 TDD TSI.1 TRS.1.1 TDD TSI.1 TRS.1.2 TDD TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1 TRS.1.2 TDD TSI.1	Gap pattern ID			*[gp0]	
Image: Control of Sync Threshold   absent   absent   absent   absent   absent   absent   absent   the UE   applies the value 0   (Table 8.1.1-1).		igned as candidate			N
absent, the UE applies the value 0. (Table 8.1.1-1).   rsrp-ThresholdSSB					
applies the value 0. (Table 8.1.1-1).   rsrp-ThresholdSSB	rlmInSyncOutOfS	syncThreshold		absent	When the field is
Cable 8.1.1-1).   Italian   Capital Scale					
ThresholdSSB   dBm   [-96]   Threshold used for Qin_LR_SSB   db0   Used for deriving rsrp-ThresholdCSIRS   See clause 5.17 of TS 38.321 [7]   dc1   dc2   dc2   dc3					applies the value 0.
DeamFailureInstanceMaxCount   DeamFailureDetectionTimer					
DowerControlOffsetSS   Double   Doubl	rsrp-ThresholdSS	BB	dBm	[-96]	
DeamFailureInstanceMaxCount   En2   See clause 5.17 of TS 38.321 [7]					
RS	powerControlOffs	setSS		db0	
beamFailureInstanceMaxCount         [n2]         see clause 5.17 of TS 38.321 [7]           beamFailureDetectionTimer         [pbfd4]         see clause 5.17 of TS 38.321 [7]           CSI-RS         Config 1         CSI-RS.1.2 FDD         A.3.14           configuration         Config 2         CSI-RS.1.2 TDD         CSI-RS.2.2 TDD           TRS         Config 1         TRS.1.1 FDD         TRS.1.1 TDD           configuration         Config 2         TRS.1.1 TDD         TRS.1.2 TDD           T1         s         1         During this time the the UE shall be fully synchronized to cell 1           T2         s         0.4           T3         s         [0.6]           T4         s         [0.4]           T5         s         [1.4]           D1         s         [0.44]					
TS 38.321 [7]					
beamFailureDetectionTimer         [pbfd4]         see clause 5.17 of TS 38.321 [7]           CSI-RS config 1 config 2 config 3         CSI-RS.1.2 FDD CSI-RS.1.2 TDD CSI-RS.2.2 TDD         A.3.14           TRS config 1 config 2 config 2 config 2 config 3         TRS.1.1 FDD TRS.1.1 TDD TRS.1.2 TDD           T1         S         1         During this time the the UE shall be fully synchronized to cell 1           T2         S         0.4	beamFailureInsta	nceMaxCount		[n2]	
CSI-RS   Config 1   CSI-RS.1.2 FDD   A.3.14	haam Failura Data	ation Times		[nhfal4]	
CSI-RS configuration         Config 2 Config 3         CSI-RS.1.2 FDD CSI-RS.1.2 TDD CSI-RS.2.2 TDD         A.3.14           TRS configuration         Config 1 TRS.1.1 FDD Config 2 TRS.1.1 TDD TRS.1.2 TDD         TRS.1.1 TDD TRS.1.2 TDD         TRS.1.2 TDD           T1         S         1 During this time the the UE shall be fully synchronized to cell 1         TO Config 2 TRS.1.2 TDD           T1         S         0.4         TO Config 2 TRS.1.2 TDD           T2         S         0.4         TO CONTROL TO TRS.1.2 TDD           T2         S         0.4         TO CONTROL TO TRS.1.2 TDD           T4         S         [0.6]         TO CONTROL TO TRS.1.2 TDD           T4         S         [0.6]         TO CONTROL TO TRS.1.2 TDD           T5         S         [0.4]         TO CONTROL TO TRS.1.2 TDD           T6         S         [0.4]         TO CONTROL TO TRS.1.2 TDD           T7         S         [0.6]         TO CONTROL TO TRS.1.2 TDD           T6         S         [0.4]         TO CONTROL TO TRS.1.2 TDD           T7         S         [0.4]         TO CONTROL TO TRS.1.2 TDD           T8         S         [0.4]         TO CONTROL TO TRS.1.2 TDD           T8         S         [0.4]         TO CONTROL TO TRS.1.2 TDD <tr< td=""><td>beamFallureDete</td><td>ction i imer</td><td></td><td>[pbfd4]</td><td></td></tr<>	beamFallureDete	ction i imer		[pbfd4]	
configuration         Config 2 Config 3         CSI-RS.1.2 TDD CSI-RS.2.2 TDD           TRS configuration         Config 1 Config 2 Config 3         TRS.1.1 TDD TRS.1.2 TDD           T1         S         1         During this time the the UE shall be fully synchronized to cell 1           T2         S         0.4           T3         S         [0.6]           T4         S         [0.4]           T5         S         [1.4]           D1         S         [0.44]	CCLDC	Config 1		CCLDC 1 2 EDD	
Config 3			1		A.S. 14
TRS config 1         Config 2         TRS.1.1 FDD           Config 2         TRS.1.1 TDD           T1         S         1         During this time the the UE shall be fully synchronized to cell 1           T2         S         0.4           T3         S         [0.6]           T4         S         [0.4]           T5         S         [1.4]           D1         S         [0.44]	Comiguration		1		-
Configuration         Config 2 Config 3         TRS.1.1 TDD TRS.1.2 TDD           T1         s         1         During this time the the UE shall be fully synchronized to cell 1           T2         s         0.4         0.6         0.6         0.6         0.4         <	TDS				
Config 3   TRS.1.2 TDD					
T1     s     1     During this time the the UE shall be fully synchronized to cell 1       T2     s     0.4       T3     s     [0.6]       T4     s     [0.4]       T5     s     [1.4]       D1     s     [0.44]	Johngaration				
the UE shall be fully synchronized to cell 1  T2	T1	Coming 5	9		During this time the
T2         S         0.4           T3         S         [0.6]           T4         S         [0.4]           T5         S         [1.4]           D1         S         [0.44]				'	
T2 S 0.4 T3 S [0.6] T4 S [0.4] T5 S [1.4] D1 S [0.44]					
T2     s     0.4       T3     s     [0.6]       T4     s     [0.4]       T5     s     [1.4]       D1     s     [0.44]					
T3         s         [0.6]           T4         s         [0.4]           T5         s         [1.4]           D1         s         [0.44]	T2		s	0.4	
T4         s         [0.4]           T5         s         [1.4]           D1         s         [0.44]					
T5         s         [1.4]           D1         s         [0.44]					
D1 s [0.44]					
	Note 1: UE-spe	ecific PDCCH is not transi	mitted afte	r T1 starts.	•

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.6.5.5.4.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter L		Unit			Test 1		Test 2					
					-RS of se	et qo				-RS of se	et q₁	
			T1	T2	Т3	T4	T5	T1	T2	T3	T4	T5
EPRE ra	tio of PSS	dB										
to SSS												
	tio of PBCH	dB										
DMRS to	SSS											
EPRE ra	tio of PBCH	dB										
to PBCH	DMRS											
EPRE ra		dB										
	DMRS to											
SSS												
EPRE ra		dB										
	to PDCCH											
DMRS					0					0		
EPRE ra		dB										
	DMRS to											
SSS												
EPRE ra		dB										
	to PDSCH											
DMRS												
	tio of OCNG	dB										
	SSS(Note 1)											
	tio of OCNG	dB										
to OCNG	DMRS (Note											
	0 6 - 4	-in	[6]	F 01	F 401	F 4 01	[ 40]	[ 40]	F 4 01	F 401	1.01	[-7]
SNR_C SI-RS	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
31-13	Config 2	1	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[7]
$N_{oc}$	Config 1	dBm/			-98					-98		
· 'oc	Config 2	15K			-98					-98		
	Config 3	Hz			-98					-98		
Propaga				TDL-	C 300ns 1	100Hz			TDL-0	C 300ns 1	00Hz	
condition												
Note 1:	OCNG shall	l be use	d such th	at the res	sources ir	ı Cell 1 aı	e fullv all	located a	nd a cons	stant total	transmit	æd

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.5.5.4.1-4: Measurement gap configuration for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Field	Test 2
Field	Value
gapOffset	[0]

Table A.6.5.5.4.1-5: Void

Table A.6.5.5.4.1-6: Void

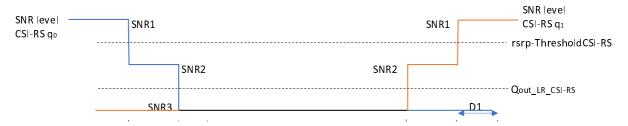


Figure A.6.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.6.5.5.4.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.5.6 Active BWP switch delay

## A.6.5.6.1 DCI-based and Timer-based Active BWP Switch

## A.6.5.6.1.1 NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA

#### A.6.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.6.5.6.1.1.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2) as given in Table A.6.5.6.1.1.1-2. NR Cell-specific parameters is specified in Table A.6.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).
- UE is configured with 2 different UE-specific bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

### During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than at PCell's slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PCell's BWP-2 no later than slot  $(i+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

#### During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than PCell's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on SCell's BWP-1 no later than slot  $(j+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

Table A.6.5.6.1.1.1-1: DL BWP switch supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD -FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode
3	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – FDD duplex mode
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode
5	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD - TDD duplex mode
Note 1:	The UE is only required to be tested in one of the supported test configurations

Table A.6.5.6.1.1.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		2	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and SCell
bwp-InactivityTimer	ms	[200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on SCC.
Cell2 timing offset to cell1	μs	3	Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.
T1	S	0.2	
T2	S	0.2	
T3	S	0.2	

Table A6.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parame	ter	Unit	Cell 1	Cell2	
Frequency Range			FR1	FR1	
Duplex mode	Config 1		FDD	FDD	
	Config 2,5		TDD	TDD	
	Config 3		TDD	FDD	
	Config 4		FDD	TDD	
TDD configuration	Config 1		Not Applicable	Not Applicable	
	Config 2		TDDConf.1.1	TDDConf.1.1	
	Config 3		TDDConf.1.1	Not Applicable	
	Config 4		Not Applicable	TDDConf.1.1	
	Config 5		TDDConf.1.2	TDDConf.1.2	
BWchannel	Config 1,2,3,4		10 MHz: N <sub>RB,c</sub> = 52	10 MHz: $N_{RB,c} = 52$	
	Config 5		40 MHz: N <sub>RB,c</sub> = 106	40 MHz: N <sub>RB,c</sub> = 106	
Active BWP ID			1, 2	3	
Initial BWP Configuration	1		DLBWP	.0.2 <sup>Note4</sup>	
Active BWP-1 Configura	tion		DLBWP.1.1 <sup>Note4</sup>	-	
Active BWP-2 Configura	tion		DLBWP.1.3 <sup>Note4</sup>	-	
PDSCH Reference	Config 1		SR.1.1 FDD	SR.1.1 FDD	
measurement channel	Config 2		SR.1.1 TDD	SR.1.1 TDD	
	Config 3		SR.1.1 TDD	SR.1.1 FDD	
	Config 4		SR.1.1 FDD	SR.1.1 TDD	
	Config 5		SR.2.1 TDD	SR.2.1 TDD	
RMSI CORESET	Config 1		CR.1.1 FDD	CR.1.1 FDD	
parameters	Config 2		CR.1.1 TDD	CR.1.1 TDD	
	Config 3		CR.1.1 TDD	CR.1.1 FDD	
	Config 4		CR.1.1 FDD	CR.1.1 TDD	
	Config 5		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET	Config 1		CCR.1.1 FDD	CCR.1.1 FDD	
parameters	Config 2		CCR.1.1 TDD	CCR.1.1 TDD	
	Config 3		CCR.1.1 TDD	CCR.1.1 FDD	
	Config 4		CCR.1.1 FDD	CCR.1.1 TDD	
00110	Config 5		CCR.2.1 TDD	CCR.2.1 TDD	
OCNG Patterns	Ta # (22)		OF		
SSB Configuration	Config 1,2,3,4	<u> </u>	SSB.1 FR1		
	Config 5		SSB.2	2 FR1	

SMTC Configuration			SMT	Ū.1
Correlation Matrix ar	nd Antenna		1x2	Low
Configuration				
EPRE ratio of PSS to		dB		
EPRE ratio of PBCH	DMRS to SSS	<u> </u>		
EPRE ratio of PBCH				
EPRE ratio of PDCC		1		
EPRE ratio of PDCC	H to PDCCH DMRS	<u> </u>		
EPRE ratio of PDSC		<u> </u>	0	0
EPRE ratio of PDSC		<u> </u>		
	B DMRS to SSS(Note			
1)		<u> </u>		
EPRE ratio of OCNO	6 to OCNG DMRS			
(Note 1)				
Noc <sup>Note 2</sup>	Config 1,2,3,4	dBm/SCS	[-104	[-104
	Config 5		[-110	[-110
Noc <sup>Note 2</sup>		dBm/15KH	[-104	[-104
		Z		
SS-RSRP Note 3	Config 1,2,3,4	dBm/SCS	[-87	[-87
^	Config 5		[-90	[-90
Ês/Iot		dB	[17	[17
Ê <sub>s</sub> /N <sub>oc</sub>		dB	[17	[17
Io <sup>Note3</sup>	Config 1,2,3,4	dBm/	[-59	[-59
	001111g 1,2,0,1	9.36MHz		
Config 5		dBm/	[-61.9	[-61.9
		38.16MHz		
Propagation Condition			AWGN	AWGN
	all be used such that bo		llocated and a constant total t	ransmitted power spectral

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3 SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

#### A.6.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelay}+k1)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability bwp-SwitchingDelay [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot  $(i + T_{BWPswitchDelay} + kI)$ ,  $(j + T_{BWPswitchDelay} + kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

## A.6.5.6.1.2 NR FR1 DL active BWP switch with non-DRX in SA

#### A.6.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.6.5.6.1.2.1-1.

The test scenario comprises of one NR cell (Cell 1) as given in Table A.6.5.6.1.2.1-2. Cell-specific parameters of the NR cell are specified in Table A.6.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at Cell1's slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell1's BWP-2 starting from slot  $(i+T_{BWPswitchDelay})$ .

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell1.

During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at Cell1's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell1's BWP-1 starting from slot  $(j+T_{BWPswitchDelay})$ .

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

Table A.6.5.6.1.2.1-1: DL BWP switch supported test configurations

Config		Description			
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations.			
Note 2:	A UE which fulfil	s the requirements in test case A.6.5.6.1.1 can skip the test cases in A.4.5.6.1.2.			

Table A.6.5.6.1.2.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell1 on RF channel number 1.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	[200]	
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.6.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parame	ter	Unit	Cell 2	
Frequency Range			FR1	
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
TDD configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.1.2	
BW <sub>channel</sub>	Config 1		10 MHz: N <sub>RB,c</sub> = 52	
	Config 2		10 MHz: N <sub>RB,c</sub> = 52	
	Config 3		40 MHz: N <sub>RB,c</sub> = 106	
Active BWP ID	<u>-</u>		1, 2	
Initial DL BWP	Config 1 2 2			
Configuration	Config 1,2,3		DLBWP.0.2 Note 4	
Active DL BWP-1	Config 1,2,3			
Configuration	Corning 1,2,3		DLBWP.1.1 Note 4	
Active DL BWP-2	Config 1,2,3			
Configuration	Corning 1,2,3		DLBWP.1.3 Note 4	
Initial UL BWP	Config 1,2,3			
Configuration	Coming 1,2,0		ULBWP.0.2 Note 4	
Active UL BWP-1	Config 1,2,3			
Configuration	001111g 1,2,0		ULBWP.1.1 Note 4	
Active UL BWP-2	Config 1,2,3		Note 4	
Configuration	•		ULBWP.1.3 Note 4	
PDSCH Reference	Config 1		SR.1.1 FDD	
measurement channel	Config 2		SR.1.1 TDD	
	Config 3		SR.2.1 TDD	
RMSI CORESET	Config 1		CR.1.1 FDD	
parameters	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
Dedicated CORESET	Config 1		CCR.1.1 FDD	
parameters	Config 2		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD	
OCNG Patterns	T =		OP.1	
SSB Configuration	Config 1,2		SSB.1 FR1	
	Config 3		SSB.2 FR1	

SMTC Configuration			SMTC.1			
Correlation Matrix and	I Antenna		1x2 Low			
Configuration						
TRS Configuration	Config 1,4		TRS.1.1 FDD			
	Config 2,5		TRS.1.1 TDD			
	Config 3,6		TRS.1.2 TDD			
EPRE ratio of PSS to	SSS	dB	0			
EPRE ratio of PBCH [	DMRS to SSS					
EPRE ratio of PBCH t	o PBCH DMRS					
EPRE ratio of PDCCH	I DMRS to SSS					
EPRE ratio of PDCCH	I to PDCCH DMRS					
EPRE ratio of PDSCH	I DMRS to SSS					
EPRE ratio of PDSCH						
EPRE ratio of OCNG	DMRS to SSS(Note					
1)						
EPRE ratio of OCNG	to OCNG DMRS					
(Note 1)						
N <sub>oc</sub> Note 2	Config 1,2	dBm/SCS	[-104]			
	Config 3		[-101]			
Noc <sup>Note 2</sup>		dBm/15kH	[-104]			
and the second second		Z				
SS-RSRP Note 3	Config 1,2	dBm/SCS	[-87]			
<u> </u>	Config 3	<u> </u>	[-90]			
Ê <sub>s</sub> /I <sub>ot</sub>		dB	[17]			
Ê <sub>s</sub> /N <sub>oc</sub>		dB	[17]			
Io <sup>Note3</sup>	Config 1,2	dBm/ 9.36MHz	[-59]			
	0 0	dBm/	[-61.9]			
	Config 3	38.16MHz	•			
Propagation Condition	)		AWGN			
			y allocated and a constant			
			ved for all OFDM symbols.			
			not specified in the test is			
			ne and shall be modelled as			
	ppropriate power for N					
	and lo levels have bee					
	purposes. They are n					
Note 4: For unpaire	ea spectrum, a DL BW	r is linked with	an UL BWP. DLBWP.0.2 is h ULBWP.1.1; DLBWP.1.3 is			
linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].						

#### A.6.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for Cell1 in a slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for Cell1 in a slot  $(j+T_{BWPswitchDelay}+k1)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability bwp-SwitchingDelay [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.6.5.6.2 RRC-based Active BWP Switch

#### A.6.5.6.2.1 NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA

#### A.6.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6. Supported test configurations are shown in Table A.6.5.6.2.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.6.5.6.2.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.6.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

#### During T1,

Time period T1 starts when a *RRCReconfiguration* with bandwidth part configuration BWP-2, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PCell's slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PCell no later than at slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ). The UE shall be continuously scheduled on PCell's BWP-2 starting from slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PCell by counting the time from the time when the RRC Reconfiguration message including BWP switch command is sent till the time when RRC Reconfiguration Complete message is received.

Table A.6.5.6.2.1.1-1: DL BWP switch supported test configurations

Config	Description				
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1: The UE is only re-	Note 1: The UE is only required to be tested in one of the supported test configurations				

Table A.6.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
T1	S	[0.2]	

Table A.6.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parame	ter	Unit	Cell 1		
Frequency Range			FR1		
Duplex mode	Config 1,4		FDD		
-	Config 2,3,5,6	1	TDD		
TDD configuration	Config 1,4		Not Applicable		
_	Config 2,5		TDDConf.1.1		
	Config 3,6	1	TDDConf.1.2		
BW <sub>channel</sub>	Config 1,4		10 MHz: N <sub>RB,c</sub> = 52		
	Config 2,5	7	10 MHz: N <sub>RB,c</sub> = 52		
	Config 3,6	1	40 MHz: N <sub>RB,c</sub> = 106		
Active BWP ID			1, 2		
Initial DL BWP	Config 1,4		DLBWP.0.2		
Configuration	Config 2,5	7			
	Config 3,6	7			
Α	С		N		
	C	1			
	С	7			
Active DL BWP-1	Config 1,4		DLBWP.1.3		
Configuration	Config 2,5				
3	Config 3,6	†			
Active DL BWP-2	Config 1,4		DLBWP.1.1		
Configuration	Config 2,5	†			
3	Config 3,6				
Initial UL BWP	Config 1,4		ULBWP.0.2		
Configuration	Config 2,5	†			
a comigar control	Config 3,6	†			
Active UL BWP-1	Config 1,4		ULBWP.1.3		
Configuration	Config 2,5	†			
a comigar control	Config 3,6	†			
Active UL BWP-2	Config 1,4		ULBWP.1.1		
Configuration	Config 2,5	†			
a comigar control	Config 3,6				
PDSCH Reference	Config 1,4		SR.1.1 FDD		
measurement channel	Config 2,5	†	SR.1.1 TDD		
	Config 3,6	1	SR2.1 TDD		
RMSI CORESET	Config 1,4		CR.1.1 FDD		
parameters	Config 2,5	†	CR.1.1 TDD		
F == 0.000	Config 3,6	†	CR2.1 TDD		
Dedicated CORESET	Config 1,4	1	CCR.1.1 FDD		
parameters	Config 2,5	╡	CCR.1.1 TDD		
F == 0.000	Config 3,6	†	CCR.2.1 TDD		
OCNG Patterns	Coming 0,0	1	OP.1		
SSB Configuration	Config 1,2,4,5	1	SSB.1 FR1		
COD Comiguration	Config 3,6	1	SSB.2 FR1		
SMTC Configuration	Coming 5,6	1	SMTC.1		
TRS Configuration	Config 1,4	1	TRS.1.1 FDD		
113 Configuration	Colling 1,4		ווט.ו.ו דטט		

	Config 2,5		TRS.1.1 TDD
			TRS.1.2 TDD
Antonno Configuration	Config 3,6		
Antenna Configuration			1x2
Propagation Condition	0	-ID	AWGN
EPRE ratio of PSS to SS		dB	0
EPRE ratio of PBCH DM			
EPRE ratio of PBCH to P			
EPRE ratio of PDCCH DI			
EPRE ratio of PDCCH to	PDCCH DMRS		
EPRE ratio of PDSCH DI	MRS to SSS		
EPRE ratio of PDSCH to			
EPRE ratio of OCNG DM			
EPRE ratio of OCNG to 0	OCNG DMRS(Note		
1)			
N <sub>oc</sub> Note 2		dBm/15	[-104]
		kHz	
SS-RSRP Note 3		dBm/15	[-87]
		kHz	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Io <sup>Note3</sup>	Config 1 2 4 E	dBm/	TBD
	Config 1,2,4,5	9.36MHz	
	Config 3,6	dBm/	TBD
	Corning 3,6	38.16MHz	
			y allocated and a constant
			red for all OFDM symbols.
Note 2: Interference fr	om other cells and r	noise sources i	not specified in the test is
assumed to be	e constant over subo	carriers and tim	ne and shall be modelled
as AWGN of a	ppropriate power fo	r N₀c to be fulfi	lled.
			other parameters for
			ameters themselves.
			red with an UL BWP.
	linked with ULBWP	•	
		with ULBWP.	1.3 defined in clause 12 of
TS 38.213 [3].			

## A.6.5.6.2.2.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell in a slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.6 Measurement procedure

## A.6.6.1 Intra-frequency Measurements

## A.6.6.1.1 SA event triggered reporting tests without gap under non-DRX

## A.6.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

#### A.6.6.1.1.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table A.6.6.1.1.1-1 and A.6.6.1.1.1-2 below. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.6.6.1.1.1.2-1: Supported test configurations

Co	nfiguration	Description
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	quired to be tested in one of the supported test configurations.

Table A.6.6.1.1.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FR1

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3		OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	S	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.6.6.1.1.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1

Parameter	Unit	Test	Cell 1 T1 T2		Cell 2	
		configuration			T1	T2
TDD configuration		1	TN/A		TN/A	
		2	TDDConf.1.1		TDDConf.1.1 TDDConf.	
		3	TDDConf.2.1		TDDConf.2.1	

PDSCH RMC		1	SR.1.	1 FDD	N/	/A	
configuration		2		1 TDD			
-		3		1 TDD			
RMSI CORESET		1		CR.1.1 FDD		CR.1.1 FDD	
RMC		2		1 TDD	CR.1.1 TDD		
configuration		3		1 TDD		1 TDD	
Dedicated		1	CCR.1.1 FDD				
CORESET RMC		2		.1 TDD	CCR.1		
configuration		3		.1 TDD	CCR.2		
OCNG Patterns		1, 2, 3	OF		OF		
TRS		1		.1 FDD		/A	
Configuration		2	_	.1 TDD	N/		
J		3		.2 TDD	N/	/A	
Ilnitial BWP		1, 2, 3	DLBWP.0.1		DLBW		
configuration			ULBV		ULBW		
Active DL BWP		1, 2, 3	DLBV	/P.1.1	DLBW	/P.1.1	
configuration			<u> </u>		=		
Active UL BWP		1, 2, 3	ULBV	3WP.1.1 ULBWP.1.1		/P.1.1	
configuration RLM-RS		1, 2, 3		SSB SSB		PD P	
	dBm/SCS	1, 2, 3	3.		98	рЬ	
$N_{oc}^{}$ Note 2	ubiii/303	2	+			98	
		3	+		95		
<b>N</b> 7	dBm/15 KHz	<u>3</u> 1	+		98		
$N_{oc}$ Note 2	dDIII/13 KI12	2			30		
		3					
î /ı	dB	<u>-</u> 1	4	-1.46	-Infinity	-1.46	
${ m \hat{E}}_{ m s}/{ m I}_{ m ot}$		2			,		
		3					
$\hat{F}/N$	dB	1	4	4	-Infinity	4	
$\hat{E}_s/N_{oc}$	dB	2	4	4	-Infinity	4	
-,		2 3		·	·	•	
$\hat{E}_s/N_{oc}$	dB dBm/SCS KHz	2 3 1	-94	-94	-Infinity	-94	
-,		2 3 1 2	-94 -94	-94 -94	-Infinity -Infinity	-94 -94	
SS-RSRP Note 3	dBm/SCS KHz	2 3 1 2 3	-94 -94 -91	-94 -94 -91	-Infinity -Infinity -Infinity	-94 -94 -91	
-,	dBm/SCS KHz	2 3 1 2 3 1	-94 -94 -91 -64.60	-94 -94 -91 -62.25	-Infinity -Infinity -Infinity64.60	-94 -94 -91 -62.25	
SS-RSRP Note 3	dBm/SCS KHz  dBm/9.36 MHz dBm/9.36 MHz	2 3 1 2 3 1 2	-94 -94 -91 -64.60 -64.60	-94 -94 -91 -62.25 -62.25	-Infinity -Infinity -Infinity 64.60	-94 -94 -91 -62.25	
SS-RSRP Note 3	dBm/SCS KHz	2 3 1 2 3 1	-94 -94 -91 -64.60	-94 -94 -91 -62.25 -62.25 -56.16	-Infinity -Infinity -Infinity64.60	-94 -94 -91 -62.25	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.6.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.1.2 SA event triggered reporting tests without gap under DRX

# A.6.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

# A.6.6.1.2.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.2.2-1, A.6.6.1.2.2-2 and A.6.6.1.2.2-3 below. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.6.6.1.2.2-1: Supported test configurations

	Configuration	Description				
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	e: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.6.1.2.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX

Parameter	Unit	Test configur	Value		Comment
		ation	Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and	Cell 2	
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving		1	3 μs		Synchronous cells
and neighbour cells		2	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		3	3 μs		Synchronous cells
T1	S	1, 2, 3	5		
T2	S	1, 2, 3	5	10	

Table A.6.6.1.2.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX

Parameter	Unit	Test	Cell 1		Cell 2		
		configuration	T1	T2	T1	T2	
TDD configuration		1		I/A		TN/A	
		2		onf.1.1	TDDC		
		3		onf.2.1	TDDC		
PDSCH RMC		1	SR.1.	1 FDD	N.	/A	
configuration		2	SR.1.	1 TDD	1		
		3	SR.2.	1 TDD			
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC		2		1 TDD		1 TDD	
configuration		3		1 TDD	CR.2.		
Dedicated		1		.1 FDD	CCR.1		
CORESET RMC		2		.1 TDD	CCR.1		
configuration		3		.1 TDD	CCR.1		
•							
OCNG Patterns		1, 2, 3		P.1	OF		
TRS configuration		1 2		.1 FDD .1 TDD	N,		
		3			N/A		
IInitial BWP		1, 2, 3	TRS.1.2 TDD DLBWP.0.1		N/A DLBWP.0.1		
configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1		
Active DL BWP		1, 2, 3	DLBWP.1.1		DLBWP.1.1		
configuration		1, 2, 3	DLDVVF.1.1		DEBV	/1 .1.1	
Active UL BWP		1, 2, 3	ULBWP.1.1		ULBW	/P 1 1	
configuration		1, 2, 0	OLDWI .I.I		022		
RLM-RS		1, 2, 3	SSB		SSB		
$N_{oc}$ Note 2	dBm/SCS	1	-98				
IV oc Note 2		2			-98		
		3	-95				
M Note 2	dBm/15 KHz	1			.98		
$N_{oc}$ Note 2		2					
		3					
f: /I	dB	1	4	-1.46	-Infinity	-1.46	
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		2			1		
		3					
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
$\mathbf{L}_{s}/I\mathbf{V}_{oc}$		2					
		3					
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94	
		2	-94	-94	-Infinity	-94	
	_	3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25	
	dBm/9.36 MHz	2	-64.60	-62.25	64.60	-62.25	
	dBm/38.16 MHz	3	-58.50	-56.16	58.50	-56.16	
Propagation Condition		1, 2, 3		AV	VGN		

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.6.1.2.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX

# A.6.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

### A.6.6.1.3.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.3.1-1 and A.6.6.1.3.1-2 below. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

ConfigurationDescription115 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode215 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode330 kHz SSB SCS, 40 MHz bandwidth, TDD duplex modeNote:The UE is only required to be tested in one of the supported test configurations.

Table A.6.6.1.3.2-1: Supported test configurations

Table A.6.6.1.3.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2, 3	40	
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
		2	CSI-RS.1.2 TDD	
		3	CSI-RS.2.2 TDD	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX	ms	1, 2, 3		OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.6.6.1.3.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1

Parameter	Unit	Test	Ce	Cell 1		II 2	
		configuration	T1	T2	T1	T2	
TDD configuration		1	TN	N/A	TN	TN/A	
		2	TDDC	onf.1.1	TDDC	onf.1.1	
		3	TDDC	onf.2.1	TDDC	onf.2.1	
PDSCH RMC		1	SR.1.	SR.1.1 FDD		N/A	
configuration		2	SR.1.	1 TDD			
		3	SR.2.	1 TDD			
RMSI CORESET		1	CR.1.1 FDD		CR.1.	1 FDD	
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD	
configuration		3	CR.2.	1 TDD	CR.2.	1 TDD	
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD	
configuration		3	CCR.2	.1 TDD	CCR.2	.1 TDD	

OCNG Patterns		1, 2, 3	Ol	P.1	OF	P.1	
TRS configuration		1	TRS.1	TRS.1.1 FDD		/A	
ga.ao		2		TRS.1.1 TDD		N/A	
		3		.2 TDD	N/		
Ilnitial BWP		1, 2, 3		VP.0.1	DLBW		
configuration		1, 2, 0		VP.0.1	ULBW		
Active DL BWP		1, 2, 3		VP.1.2	DLBW		
configuration		1, 2, 0		••••			
Active UL BWP		1, 2, 3	ULBV	VP.1.1	ULBW	/P 1 1	
configuration		1, 2, 0	025.	• • • • • • •	02511		
RLM-RS		1, 2, 3	CSI	-RS	SS	SB	
	dBm/SCS	1			-98		
$N_{oc}^{}$ Note 2		2	-98				
		3	-95				
M. N. O	dBm/15 KHz	1	-98				
$N_{oc}^{}$ Note 2	abilit to this	2	-				
		3	-				
<b>∱</b> / <b>T</b>	dB	1	4	-1.46	-Infinity	-1.46	
${ m \hat{E}}_{_{ m s}}/{ m I}_{_{ m ot}}$	u.D	2	┪ '	1.10		11.10	
		3					
A /37	dB	1	4	4	-Infinity	4	
$\hat{E}_s/N_{oc}$	u.D	2	· ·			•	
		3	-				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94	
	G2, GGG . W. I	2	-94	-94	-Infinity	-94	
		3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25	
-		-				-62.25	
Propagation	GB111, GG1 10 1VII 12		55.00			55.10	
		1, 2, 0		, , ,			
Propagation Condition	dBm/9.36 MHz dBm/38.16 MHz	2 3 1, 2, 3	-64.60 -58.50	-62.25 -56.16 AV	64.60 58.50 VGN	-62.25 -56.16	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.6.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX

# A.6.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

# A.6.6.1.4.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.4.2-1, A.6.6.1.4.2-2 and A.6.6.1.4.2-3 below. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.6.6.1.4.2-1: Supported test configurations

С	onfiguration	Description			
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note:	te: The UE is only required to be tested in one of the supported test configurations.				

Table A.6.6.1.4.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX

Parameter	Unit	Test configur	Value		Comment
		ation	Test 1	Test 2	
Active cell		1, 2, 3	Cell 1	•	
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and		
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
CSI-RS parameters		1	CSI-RS.1.2 F		
		2	CSI-RS.1.2 T		
		3	CSI-RS.2.2 T	TDD	
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells

T1	S	1, 2, 3	5		
T2	S	1, 2, 3	5	10	

Table A.6.6.1.4.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX

Parameter	Unit	Test	Ce	Cell 1		II 2	
		configuration	T1	T2	T1	T2	
TDD configuration		1	TN	V/A	TN/A		
		2	TDDC	onf.1.1	TDDC	onf.1.1	
		3	TDDC	onf.2.1	TDDC	onf.2.1	
PDSCH RMC		1	SR.1.	1 FDD	N.	/A	
configuration		2	SR.1.	1 TDD			
		3	SR.2.	1 TDD	1		
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD	
configuration		3		1 TDD		1 TDD	
Dedicated		1		.1 FDD		.1 FDD	
CORESET RMC		2		.1 TDD		.1 TDD	
configuration		3		2.1 TDD		.1 TDD	
OCNG Patterns		1, 2, 3		P.1	OF OF		
TRS configuration		1, 2, 3		.1 FDD		/A	
TKS Cornigulation		2					
		3		TRS.1.1 TDD TRS.1.2 TDD		N/A N/A	
IInitial BWP		1, 2, 3	DLBWP.0.1		DLBWP.0.1		
configuration		1, 2, 0	ULBWP.0.1		ULBWP.0.1		
Active DL BWP		1, 2, 3	DLBWP.1.2		DLBV	/P.1.1	
configuration		., _, -	<i>DEDTTI 11.2</i>				
Active UL BWP		1, 2, 3	ULBWP.1.1		ULBWP.1.1		
configuration		, ,					
RLM-RS		1, 2, 3	CSI	I-RS	SS	SB	
Note 2	dBm/SCS	1		-	.98		
1 oc		2		-	.98		
		3		-	·95		
Note 2	dBm/15 KHz	1		-	.98		
1 voc		2					
		3					
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-1.46	-Infinity	-1.46	
s/ ot	_	2					
		3					
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
-s/- oc		2	4				
00 0005 11110	ID (065::::	3			1.6.		
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94	
		2	-94	-94	-Infinity	-94	
I.	-ID /O CO 141 I	3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25	
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25	
	dBm/38.16 MHz	3	-58.50	-56.16	58.50	-56.16	

Propagat	ion		1, 2, 3	AWGN				
Condition	l							
Note 1:	Note 1: Table A.6.6.1.4.2-1The resources for uplink transmission are assigned to the UE prior to the							
	start of time period T2.							
Note 2:	Table A.6.6.1.4.2-1Interference from other cells and noise sources not specified in the test is							
	assumed	assumed to be constant over subcarriers and time and shall be modelled as AWGN of						
	appropriate power for $N_{oc}$ to be fulfilled.							
Note 3:		6.6.1.4.2-1SS-RSRP		ved from other parameters for information elves.				

Table A.6.6.1.4.2-4: Void

Table A.6.6.1.4.2-5: Void

# A.6.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading

# A.6.6.1.5.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

# A.6.6.1.5.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.5.2-1 and A.6.6.1.5.2-2 below. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.6.6.1.5.2-1: Supported test configurations

Configuration Description						
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
Note:	ote: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.6.1.5.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.6.6.1.5.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test	Се	Cell 1 T1 T2		II 2
		configuration	T1			T2
TDD configuration		1	N/A		N/A	
PDSCH RMC		1	SR.1.	1 FDD	N.	/A
configuration						
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD
RMC						
configuration						
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD
CORESET RMC						
configuration			0.			
OCNG Patterns		1	_	P.1	OP.1	
TRS configuration		1		.1 FDD	N/A	
Ilnitial BWP		1		VP.0,1	DLBWP.0.1	
configuration		4		VP.0.1	ULBWP.0.1	
Active DL BWP		1	DLBV	VP.1.1	DLBWP.1.1	
configuration Active UL BWP		1	LILDW	VP.1.1	ULBWP.1.1	
		I	ULBV	VP.1.1	ULBWP.1.1	
configuration RLM-RS		1	0	SB	SSB	
	dBm/SCS	1	3.		.98	30
$N_{oc}^{}$ Note 2	ubili/303	'		-	.90	
$N_{oc}$ Note 2	dBm/15 KHz	1	-98			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4 -1.46		-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4 4		-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25

Propagation			1	AWGN				
Condition	Condition							
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.								
Note 2:	· <del>-</del> ·							
	$N_{oc}$ to I	be fulfilled.						
Note 3:		P levels have been de	•	ameters for information purposes. They are				

# A.6.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading

### A.6.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

# A.6.6.1.6.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.6.2-1 and A.6.6.1.6.2-2 below. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.6.6.1.6.2-1: Supported test configurations

С	onfiguration	Description
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
Note:	The UE is only re	quired to be tested in one of the supported test configurations.

Table A.6.6.1.6.2-2: General test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
Measurement gap type		1	Per-UE gaps	
Measurement gap repitition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.6.6.1.6.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test	Ce	I 1	Cell 2		
		configuration	T1 T2		T1	T2	
TDD configuration		1	N/	Ά	N/A		
PDSCH RMC configuration		1	SR.1.	I FDD	N/A		
RMSI CORESET RMC configuration		1	CR.1.	CR.1.1 FDD		1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1	CCR.1.1 FDD		.1 FDD	
OCNG Patterns		1	OF	P.1	OP.1		
TRS configuration		1	TRS.1.	1 FDD	N/A		
IInitial BWP configuration		1	DLBW ULBW	-	DLBWP.0.1 ULBWP.0.1		
Active DL BWP configuration		1	DLBW	/P.1.2	DLBW	/P.1.1	
Active UL BWP configuration		1	ULBW	ULBWP.1.1		/P.1.1	
RLM-RS		1	CSI-RS		SS	SB	
$N_{oc}$ Note 2	dBm/SCS	1	-98				
$N_{oc}$ Note 2	dBm/15 KHz	1		-	-98		

$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25
Propagation Condition		1	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.6.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.2 Inter-frequency Measurements

# A.6.6.2.1 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.6.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.1.1-1, A.6.6.2.1.1-2 and A.6.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.6.6.2.1.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description				
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1: Note 2:	Note 1: The UE is only required to be tested in one of the supported test configurations					

Table A.6.6.2.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Va	lue	Comment
		configurati on	Test 1 Test 2		
NR RF Channel Number		Config 1,2,3	1	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	19	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	S	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	S	Config 1,2,3	T1	T1	

Table A.6.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 1 T1 T2		Cell 2	
		configuratio			T1	T2
		n				
NR RF Channel Number		Config 1,2,3	1		2	
Duplex mode		Config 1	FDD			
		Config 2,3	TDD			

TDD anding		1	Carefin 4		No. /	\ !:  -  -	
TDD configuration			Config 1			Applicable	
			Config 2		TDDConf.1.1		
BW <sub>channel</sub>		MHz	Config 3		TDDConf.2.1 10: N <sub>RB,c</sub> = 52		
DVVchannel		IVITZ	Config 1,2 Config 3				
BWP BW		MHz				I <sub>RB,c</sub> = 106	
DVVP DVV		IVITZ	Config 1,2 Config 3			$N_{RB,c} = 52$	
BWP	Initial DL BWP		Corning 3	DI DI		$I_{RB,c} = 106$	NA
configurati	Initial UL BWP				DLBWP.0.1 ULBWP.0.1		NA NA
on	Dedicated DL		Config 1, 2,		/P.1.1		NA
0.1	BWP		3	DLDV	VI . I. I		INA
	Dedicated UL		Ŭ				
	BWP			ULBV	/P.1.1		NA
TRS configu			_	TRS.1	.1 FDD		NA
Tite comiga	il all of t		Config 1	11.0.11			
				TRS 1	.1 TDD		NA
			Config 2	11(0.1)	. 1 100		14/ (
				TDC 1	.2 TDD		NA
			Config 3	113.1	.2 100	1	INC
OCNG Patto	erns defined in		Config 1,2,3			+	
A.3.2.1.1 (O			Coming 1,2,3	O	P.1		)P.1
PDSCH Ref			0 " 1				71 . 1
measuremen			Config 1		1 FDD		-
Incasuleme	il Chamilei		Config 2		1 TDD		
			Config 3		I TDD		
CORESET F	Reference		Config 1	CR.1.	1 FDD		-
Channel			Config 2		1 TDD		
			Config 3	CR2.	1 TDD		
	guration defined		Config 1		SI	MTC.2	
In A.3.11.1 a	and A.3.11. 2		3				
			Config 2, 3		SI	MTC.1	
PDSCH/PD0	CCH subcarrier	kHz	Config 1,2			15	
spacing			Config 3			30	
EPRE ratio	of PSS to SSS						
FPRF ratio	of PBCH DMRS						
to SSS	or r Borr Billing						
	of PBCH to PBCH						
DMRS							
EPRE ratio	of PDCCH DMRS						
to SSS							
EPRE ratio	of PDCCH to				_		
PDCCH DM			Config 1,2,3	(	)	1	0
	of PDSCH DMRS					1	
to SSS						1	
	of PDSCH to					1	
PDSCH						1	
	of OCNG DMRS					1	
to SSS(Note						1	
EPRE ratio						1	
OCNG DMR	(Note 1)	dDm/4E		00		1	00
N oc Note2		dBm/15 kHz		-98			-98
N oc Note2		dBm/S	Config 1,2		98		-98
		CS	Config 3	-6	95		-95
SS-RSRP No	te 3	dBm/S	Config 1,2	-94	-94	-Infinity	-91
		CS	Config 3	-91	-91	-Infinity	-88
		l 4D	Config	4 4		Infinity	7
$\hat{E}_{s}/I_{ot}$		dB	1,2,3,4,5,6	4	4	-Infinity	1

$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4	4	-Infinity	7
Io <sup>Note3</sup>		dBm/9.	Config 1,2	-64.59	-64.59		-62.26
		36MHz	-			-70.05	
		dBm/38	Config 3	-58.49	-58.49		-56.15
		.16MHz	_			-63.94	
Propagat	ion Condition		Config 1,2,3	AW	GN	A۱	VGN
Note 1:	OCNG shall be used	such that b	ooth cells are full	y allocated a	and a consta	nt total trans	mitted power
	spectral density is ac	hieved for a	all OFDM symbo	ols.			
Note 2:	Interference from oth	er cells and	d noise sources	not specified	in the test is	s assumed to	be constant
	over subcarriers and	time and sl	hall be modelled	l as AWGN o	of appropriate	e power for $j$	v c to be
	fulfilled.						
l							

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.6.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.2.2 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is used

# A.6.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.2.1-1, A.6.6.2.2.1-2 and A.6.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description			
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note 1:	The UE is only required to be tested in one of the supported test configurations				
Note 2:	target NR cell has the same SCS, BW and duplex mode as NR serving cell				

Table A.6.6.2.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value				Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel Number		Config 1,2,3		1,	2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR ce	ll 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR ce	ll2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		2		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1	FR1			As specified in clause A.3.10.1
		Config 2	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3	SSB.2	FR1			As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Norma	ıl			
TimeToTrigger	S	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX	DRX	DRX	DRX	As specified in clause A.3.3
		J , ,	.1	.2	.1	.2	·
Time offset between serving and neighbour cells		Config 1	3ms			Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.	
		Config 2,3	3μs			Synchronous cells.	
T1	s	Config 1,2,3	5				
T2	S	Config 1,2,3	T1.1	T11	T1.1	T11	

Table A.6.6.2.2.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 1		Cell 2	
		configuratio	T1	T2	T1	T2
		n				
NR RF Channel Number		Config 1,2,3	,	1		2
Duplex mode		Config 1	FDD		-DD	

			Config 2,3		TDD			
TDD configuration			Config 1	No	ot Applicable			
<u> </u>		Config 2		DDConf.1.1				
		Config 3		DDConf.2.1				
BW <sub>channel</sub>		MHz	Config 1,2		0: N <sub>RB,c</sub> = 52			
			Config 3		: N <sub>RB,c</sub> = 106			
BWP BW		MHz	Config 1,2	10: N <sub>RB,c</sub> = 100				
			Config 3		: N <sub>RB,c</sub> = 106			
BWP	Initial DL BWP		Config 1, 2,	DLBWP.0.1	NA			
configuratio			3					
	Initial UL BWP		Config 1, 2, 3	ULBWP.0.1	NA			
	Dedicated DL BWP			DLBWP.1.1	NA			
	Dedicated UL BWP			ULBWP.1.1	NA			
TRS configuration	on		Config 1	TRS.1.1 FDD	NA			
İ			Config 2	TRS.1.1 TDD	NA			
			Config 3	TRS.1.2 TDD	NA			
OCNG Patterns	defined in		Config 1,2,3					
A.3.2.1.1 (OP.1				OP.1	OP.1			
PDSCH Refere			Config 1	SR.1.1 FDD	-			
measurement of			Config 2	SR.1.1 TDD				
			Config 3					
CODECET Det	0.000			SR2.1 TDD				
Channel	CORESET Reference		Config 1	CR.1.1 FDD	<del>_</del>			
Charmer	Channel		Config 2	CR.1.1 TDD				
SMTC configuration defined			Config 3	CR2.1 TDD				
in A.3.11.1 and			Config 1		SMTC.2			
			Config 2, 3		SMTC.1			
PDSCH/PDCCI	H subcarrier	kHz	Config 1,2	15				
spacing			Config 3		30			
EPRE ratio of P	SS to SSS							
EPRE ratio of F to SSS	BCH DMRS							
EPRE ratio of P	BCH to PBCH							
EPRE ratio of F to SSS	DCCH DMRS							
EPRE ratio of F			Config 1,2,3	0	0			
	EPRE ratio of PDSCH DMRS							
EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N oc Note2		dBm/15 kHz	Config 1,2,3	-98	-98			
N Note2		dBm/S	Config 1,2	-98	-98			
IV ac		CS	Config 3	-95	-95			
	SS-RSRP Note 3				-Infinity -91			

	dBm/S CS	Config 3	-91	-91	-Infinity	-88
$\hat{E}_{\!\scriptscriptstyle \mathrm{s}}/I_{\!\scriptscriptstyle \mathrm{ot}}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2
	dBm/38 .16MHz	Config 3	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3	AW	'GN	A۱	NGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.6.6.2.2.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection

Field	Test1&3	Test2&4	Comment
	Value	Value	
drx-onDurationTimer	ms1	ms1	As specified in clause 6.3.2 in TS
drx-InactivityTimer	ms1	ms1	38.331 [2]
drx-RetransmissionTimerDL	sl1	sl1	
drx-RetransmissionTimerUL	sl1	sl1	
drx-LongCycleStartOffset	ms40	Ms640	
shortDRX	disable	disable	

Table A.6.6.2.2.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection

Field	Value	Comment
TimeAlignmentTimer	ms500	As specified in clause 6.3.2 in TS 38.331 [2]

# A.6.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.6.6.2.3 Void

A.6.6.2.4 Void

A.6.6.2.5 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

### A.6.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.5.1-1, A.6.6.2.5.1-2 and A.6.6.2.5.1-3.In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.5.1-2 is provided for UE that supports per-FR gap..

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.6.6.2.5.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1

	Config	Description				
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1:	The UE is only required to be tested in one of the supported test configurations					
Note 2:	target NR cell has the same SCS, BW and duplex mode as NR serving cell					

Table A.6.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	2	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	39	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	S	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs		Synchronous cells.
T1	S	Config 1,2,3	5		
T2	S	Config 1,2,3	1.1	1	

Table A.6.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test	Ce	ell 1	Cell 2			
			configuratio n	T1	T2	T1	T2		
NR RF Chan	nel Number		Config 1,2,3		1		2		
Duplex mode	!		Config 1		F	DD			
			Config 2,3		Т	DD			
TDD configur	ation		Config 1		Not Ap	plicable			
			Config 2		TDDC	onf.1.1			
			Config 3		TDDConf.2.1				
BW <sub>channel</sub>		MHz	Config 1,2	10: $N_{RB,c} = 52$					
			Config 3		40: N <sub>RB,c</sub> = 106				
BWP BW		MHz	Config 1,2		10: $N_{RB,c} = 52$				
			Config 3		40: N <sub>RB,c</sub> = 106				
BWP	Initial DL BWP			DLB\	VP.0.1		NA		
configuratio	Initial UL BWP			ULB\	VP.0.1		NA		
n	Dedicated DL BWP		Config 1, 2, 3	, DLBWP.1.1 N		NA			
	Dedicated UL BWP			ULB\	WP.1.1		NA		
TRS configuration			Config 1	TRS.1.1 FDD		NA			
			Config 2	TRS.1	.1 TDD		NA		

		Config 3	TRS 1	.2 TDD		NA		
OCNG Patterns defined in		Config 1,2,3		P.1		DP.1		
A.3.2.1.1 (OP.1)		00111g 1,2,0			`	J		
PDSCH Reference		Config 1	SR.1.	.1 FDD		-		
measurement channel		Config 2		.1 TDD				
		Config 3		1 TDD				
CORESET Reference		Config 1		.1 FDD		-		
Channel		Config 2	CR.1.	.1 TDD				
		Config 3	CR2.	1 TDD				
SMTC configuration defined in A.3.11.1 and A.3.11. 2		Config 1		SM	TC.2			
		Config 2, 3		SM	TC.1			
PDSCH/PDCCH subcarrier	kHz	Config 1,2		1	15			
spacing		Config 3		3	30			
EPRE ratio of PSS to SSS						<u> </u>		
EPRE ratio of PBCH DMRS								
to SSS								
EPRE ratio of PBCH to PBCH								
DMRS								
EPRE ratio of PDCCH DMRS								
to SSS								
EPRE ratio of PDCCH to		Config 1,2,3		0	0			
PDCCH DMRS  EPRE ratio of PDSCH DMRS		Oornig 1,2,0		O		O		
to SSS								
EPRE ratio of PDSCH to								
PDSCH								
EPRE ratio of OCNG DMRS								
to SSS(Note 1)								
EPRE ratio of OCNG to								
OCNG DMRS (Note 1)								
N oc Note2	dBm/15		-	98		-98		
- Noto?	kHz	0 " 10						
N oc Note2	dBm/S	Config 1,2		98		-98		
SS-RSRP Note 3	CS dPm/S	Config 3		95	Infinity	-95 -91		
33-K3KF	dBm/S CS	Config 1,2 Config 3	-94 -91	-94 -91	-Infinity -Infinity	-91 -88		
<b>Ĉ</b> /r	dB	Config 1,2,3	-91 4	-91	-Infinity	-00 7		
$\hat{E}_{s}/I_{ot}$					,			
$\hat{E}_{_s}/N_{_{oc}}$	dB	Config 1,2,3	4	4	-Infinity	7		
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2		
	dBm/38 .16MHz	Config 3	-58.4	-58.49	-63.94	-56.15		
Propagation Condition		Config 1,2,3	AV	VGN	A	WGN		
Niete 4. OONO electrica de consent	Lacrada disacti				( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	144 1		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.6.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.2.6 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is used

# A.6.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.6.1-1, A.6.6.2.6.1-2 and A.6.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.6.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.6.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.2.6.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1

	Config	Description				
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1:	The UE is only required to be tested in one of the supported test configurations					
Note 2:	target NR cell has the same SCS, BW and duplex mode as NR serving cell					

Table A.6.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter	Unit	Test		Va	lue		Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel Number		Config 1,2,3	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR ce	ll 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR ce	112			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		2		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1				As specified in clause A.3.10.1
		Config 2	SSB.1				As specified in clause A.3.10.1
		Config 3	SSB.2	FR1			As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Norma	ıl			
TimeToTrigger	S	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3 ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3 μs				Synchronous cells.
T1	S	Config 1,2,3	5				
T2	S	Config 1,2,3	1.3	13.5	1.3	13.5	

Table A.6.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test	Ce	Cell 1		ell 2
			configuratio	T1	T2	T1	T2
			n				
NR RF Char	nnel Number		Config 1,2,3	•	1		2
Duplex mode	Э		Config 1			FDD	
			Config 2,3		-	TDD	
TDD configu	ration		Config 1		Not A	pplicable	
			Config 2		TDD	Conf.1.1	
			Config 3		TDD	Conf.2.1	
BW <sub>channel</sub>		MHz	Config 1,2	10: N <sub>RB,c</sub> = 52			
			Config 3		40: N	RB,c = 106	
BWP BW		MHz	Config 1,2		10: N	$I_{RB,c} = 52$	
			Config 3		40: N	<sub>RB,c</sub> = 106	
BWP	Initial DL BWP			DLBW	/P.0.1		NA
configurati	Initial UL BWP			ULBW	/P.0.1		NA
on	Dedicated DL		Config 1, 2,	DLBWP.1.1 NA		NA	
	BWP		3				
	Dedicated UL BWP			ULBW	/P.1.1		NA

TRS configuration		Config 1	TRS 1	.1 FDD		NA
110 comiguration		Config 2		.1 TDD		NA
		Config 3		.1 TDD .2 TDD		NA
OCNG Patterns defined in	+	Config 1,2,3	110.1	.2 100		INA
A.3.2.1.1 (OP.1)		Corning 1,2,3	01	P.1	ے ا	)P.1
PDSCH Reference	+	Cantin 4				7. 1
measurement channel		Config 1		1 FDD	1	-
measurement channel		Config 2		1 TDD	<u> </u>	
		Config 3		1 TDD		
CORESET Reference		Config 1	CR.1.	1 FDD	1	-
Channel		Config 2		1 TDD		
		Config 3	CR2.	1 TDD		
SMTC configuration defined		Config 1		S.	MTC.2	
in A.3.11.1 and A.3.11. 2		Corning i		Si	VIIC.Z	
		Config 0 0		CI	ATC 1	
		Config 2, 3		اات	MTC.1	
PDSCH/PDCCH subcarrier	kHz	Config 1,2			15	
spacing		Config 3			30	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS						
to SSS						
EPRE ratio of PBCH to PBCH						
DMRS						
EPRE ratio of PDCCH DMRS						
to SSS						
EPRE ratio of PDCCH to						
PDCCH DMRS		Config 1,2,3	0 0			0
EPRE ratio of PDSCH DMRS		Oomig 1,2,0	`	9		O
to SSS						
EPRE ratio of PDSCH to	+					
PDSCH EPRE ratio of OCNG DMRS						
to SSS(Note 1)						
EPRE ratio of OCNG to						
OCNG DMRS (Note 1)	dD/4.5			20		00
$N_{oc}^{\text{Note2}}$	dBm/15		-8	98		-98
Note2	kHz	Config 1.0		20		-98
N oc Note2	dBm/S	Config 1,2		98		
OO DODD Note 2	CS (2	Config 3		95		-95
SS-RSRP Note 3	dBm/S	Config 1,2	-94	-94	-Infinity	-91
	CS	Config 3	-91	-91	-Infinity	-88
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io <sup>Note3</sup>	dBm/9.	Config 1,2	-64.59	-64.59		-62.26
	36MHz	551g 1,2	000	0 1.00	-70.05	02.20
	dBm/38	Config 3	-58.49	-58.49		-56.15
	.16MHz			230	-63.94	
Propagation Condition		Config 1,2,3	AW	/GN	A۱	WGN
	<del></del>					

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.6.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.3 Inter-RAT Measurements

# A.6.6.3.1 SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1

# A.6.6.3.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

Supported test configurations are shown in table A.6.6.3.1.1-1. General test parameters are provided in Table A.6.6.3.1.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.1.1-3 and A.6.6.3.1.1-4, respectively.

Table A.6.6.3.1.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is	s only required to be tested in one of the supported test configurations

Table A.6.6.3.1.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Value	Comment
NR RF Channel Number		1	1 NR carrier frequency is used in the test
LTE RF Channel Number		1	1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Tables A.6.6.3.1.1-2 and A.6.6.3.1.1-3.	
Active cell		Cell 1	Cell 1 is on RF channel number 1
Neighbour cell		Cell 2	Cell 2 is on RF channel number 2
Gap Pattern Id		0	As specified in Clause Table 9.1.2-1. Per- UE gap pattern.
NR measurement quantity		SS-RSRP	Measurement quantity for Cell 1
Inter-RAT E-UTRAN measurement quantity		RSRP	Measurement quantity for Cell 2
b2-Threshold1	dBm	Note 1	SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-95	E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2
Hysteresis	dB	0	
TimeToTrigger	S	0	
Filter coefficient		0	L3 filtering is not used
DRX		OFF	OFF
T1	S	5	
T2	S	5	
Note 1: Values are defined	l in Table A.	6.6.3.1.1-3	

Table A.6.6.3.1.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1

Param	neter	Unit	Configuration	(	Cell 1
				T1	T2
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3	FDD	
			4, 5, 6		TDD
TDD Configuration	SCS=15 KHz		2, 5	TDD	Conf.1.1
	SCS=30 KHz		3, 6	TDD	Conf.1.2
BW <sub>channel</sub>		MHz	1, 4	10: N <sub>RB</sub> ,	c = 52 (FDD)
			2, 5	10: $N_{RB,c} = 52 \text{ (TDD)}$	
			3, 6	40: N <sub>RB,c</sub>	= 106 (TDD)
PDSCH reference m	easurement		1, 4	SR.	1.1 FDD
channel			2, 5	2, 5 SR.1.1 T	
			3, 6	SR.	2.1 TDD
CORSET reference	channel		1, 4	CR.	1.1 FDD
			2, 5	CR.	1.1 TDD

			3, 6	CR.:	2.1 TDD
BWP configurations	Initial DL BWP		1, 2, 3, 4, 5, 6		BWP.0.1
	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DLE	BWP.1.1
	Initial UL BWP		1, 2, 3, 4, 5, 6	ULE	BWP.0.1
	Dedicated UL BWP		1, 2, 3, 4, 5, 6	ULE	BWP.1.1
OCNG pattern <sup>Note1</sup>			1, 2, 3, 4, 5, 6	(	OP.1
SMTC configuration	า		1, 2, 3, 4, 5, 6	SI	MTC.1
SSB configuration			1, 2, 4, 5		3.1 FR1
J			3, 6		3.2 FR1
b2-Threshold1		dD	1, 2, 4, 5		96
		dBm	3, 6		93
EPRE ratio of PSS	to SSS		1, 2, 3, 4, 5, 6		
EPRE ratio of PBCI	H_DMRS to SSS				
EPRE ratio of PBCI	H to PBCH_DMRS				
EPRE ratio of PDC	CH_DMRS to SSS				
EPRE ratio of PDC	CH to				
PDCCH_DMRS		dB			0
EPRE ratio of PDS	CH_DMRS to SSS				
EPRE ratio of PDS	CH to				
PDSCH_DMRS					
EPRE ratio of OCN					
EPRE ratio of OCN	G to OCNG DMRS				
N <sub>oc</sub> Note2		dBm/15 KHz	1, 2, 3, 4, 5, 6		-104
Noc <sup>Note2</sup>		dBm/SCS	1, 2, 4, 5		-104
			3, 6		-101
Ê <sub>s</sub> /N <sub>oc</sub>		dB	1, 2, 3, 4, 5, 6	116	70
Ês/Iot <sup>Note3</sup>		dB	1, 2, 3, 4, 5, 6	116	70
SS-RSRP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	88	104
N. O			3, 6	85	101
SSB_RP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	88	104
		15 /5 5	3, 6	85	101
		dBm/9.36	1, 2, 4, 5	59.94	73.04
Io <sup>Note3</sup>		MHz			00.00
		dBm/38.16	3, 6	53.84	66.93
D (1		MHz	100150		DI 400
Propagation conditi			1, 2, 3, 4, 5, 6		DLA30
Antenna Configurat	tion and Correlation		1, 2, 3, 4, 5, 6	1x	2 Low
Matrix					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: É<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.6.3.1.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2		
			T1	T2	
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration Note1		4, 5, 6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1		

BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB.</sub>	o = 25		
DVV channel	IVII IZ	1, 2, 3, 4, 3, 0	10 MHz: N <sub>RB</sub>			
			20 MHz: N <sub>RB,c</sub> = 100			
PDSCH parameters:		1, 2, 3	5 MHz: R.7			
DL Reference Measurement		1, 2, 0	10 MHz: R.3 FDD			
Channel <sup>Note2</sup>			20 MHz: R.6 FDD			
Chamor		4, 5, 6	5 MHz: R.4			
		1, 0, 0	10 MHz: R.0			
			20 MHz: R.3			
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.11			
parameters:		1, 2, 0	10 MHz: R.6			
DL Reference Measurement			20 MHz: R.1			
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.11			
<b>3</b> 1.0		1, 0, 0	10 MHz: R.6			
			20 MHz: R.1			
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.2			
		., _, -	10 MHz: OP.10 FDD			
			20 MHz: OP.17 FDD			
		4, 5, 6	5 MHz: OP.9 TDD			
		, ,	10 MHz: OP.1 TDD			
			20 MHz: OP.7 TDD			
PBCH_RA		1, 2, 3, 4, 5, 6				
PBCH_RB						
PSS_RA						
SSS_RA						
PCFICH_RB						
PHICH_RA						
PHICH_RB	dB		0			
PDCCH_RA						
PDCCH_RB						
PDSCH_RA						
PDSCH_RB						
OCNG_RA <sup>Note3</sup>						
OCNG_RB <sup>Note3</sup>						
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104			
Ês/Noc	dB	1, 2, 3, 4, 5, 6	-Infinity	17		
Ês/Iot <sup>Note5</sup>	dB	1, 2, 3, 4, 5, 6	-Infinity	17		
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87		
SCH_RP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87		
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50)			
Propagation Condition		1, 2, 3, 4, 5, 6	ETU70	/		
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Low			
Correlation Matrix		, , -, -, -, -				
Note 1: Chesial subframe and			on a sitia d in table 4.0.4 in TO	00.044.[00]		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.6.6.3.1.2 Test Requirements

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

#### A.6.6.3.2 SA NR - E-UTRAN event-triggered reporting in DRX in FR1

#### A.6.6.3.2.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3. There are two test cases. In test 1 the UE shall be configured with DRX cycle of 40 ms. In test 2 the UE shall be configured with DRX cycle of 640 ms.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that eventtriggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore the UE shall be allocated with PUSCH resource at every DRX cycle.

Supported test configurations are shown in table A.6.6.3.2.1-1. General test parameters are provided in Table A.6.6.3.2.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.2.1-3 and A.6.6.3.2.1-4, respectively.

Table A.6.6.3.2.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Configuration	Description						
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD						
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD						
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD						
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD						
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD						
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD						
Note: The UE is							

Table A.6.6.3.2.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Unit	Test 1 Test 2		Comment		
		Value				
NR RF Channel Number		1		1 NR carrier frequency is used in the test		
LTE RF Channel Number		2		1 LTE carrier frequency is used in the test		
Channel Bandwidth	MHz	As specified	d in Tables			
		A.6.6.3.2.1-	-2 and			
		A.6.6.3.2.1-	-3.			
Active cell		Cell 1		Cell 1 is on RF channel number 1		
Neighbour cell		Cell 2		Cell 2 is on RF channel number 2		
Gap Pattern Id		0		As specified in Clause Table 9.1.2-1. Per-UE		
				gap pattern.		
NR measurement quantity		SS-RSRP		Measurement quantity for Cell 1		
Inter-RAT E-UTRAN		RSRP		Measurement quantity for Cell 2		
measurement quantity						
b2-Threshold1	dBm	Note 1		SS-RSRP threshold for SS-RSRP		
				measurement on cell1 for event B2		
b2-Threshold2EUTRA	dBm	-95		E-UTRAN RSRP threshold for SS-RSRP		
				measurement on cell1 for event B2		
Hysteresis	dB	0				
TimeToTrigger	S	0				
Filter coefficient		0		L3 filtering is not used		
DRX		DRX.1	DRX.2	DRX cycle configurations DRX.1 and DRX.2		
				are defined in Table A.3.3.1-1 and Table		
				A.3.3.2-1 respectively.		
T1	S	5				
T2	S	5	15			
Note 1: Values are define	ed in Table	A.6.6.3.2.1-3	3			

Table A.6.6.3.2.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1

Para	meter	Unit	Configuration		Cell 1		
				T1	T2		
RF channel number	r		1, 2, 3, 4, 5, 6		1		
Duplex mode			1, 2, 3		FDD		
			4, 5, 6		TDD		
TDD Configuration	SCS=15 KHz		2, 5	TDI	Conf.1.1		
	SCS=30 KHz		3, 6	TDI	Conf.2.1		
BW <sub>channel</sub>		MHz	1, 4	10: N <sub>RE</sub>	<sub>cc</sub> = 52 (FDD)		
			2, 5	10: N <sub>RE</sub>	<sub>i,c</sub> = 52 (TDD)		
			3, 6	40: N <sub>RB</sub> ,	c = 106 (TDD)		
PDSCH reference	measurement		1, 4	SR	.1.1 FDD		
channel			2, 5		.1.1 TDD		
			3, 6	SR	.2.1 TDD		
CORSET reference	e channel		1, 4	CR.1.1 FDD			
			2, 5	CR	.1.1 TDD		
			3, 6	CR	.2.1 TDD		
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DL	BWP.0.1		
configurations	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DL	BWP.1.1		
	Initial UL BWP		1, 2, 3, 4, 5, 6	UL	BWP.0.1		
	Dedicated UL BWP		1, 2, 3, 4, 5, 6	UL	BWP.1.1		
OCNG pattern <sup>Note1</sup>			1, 2, 3, 4, 5, 6		OP.1		
SMTC configuratio	n		1, 2, 3, 4, 5, 6	S	MTC.1		
SSB configuration			1, 2, 4, 5	SS	B.1 FR1		
			3, 6	SS	B.2 FR1		
b2-Threshold1		dBm	1, 2, 4, 5		96		

		3, 6		93				
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to								
PDCCH_DMRS	dB	1, 2, 3, 4, 5, 6		0				
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to								
PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
N <sub>oc</sub> Note2	dBm/15 KHz	1, 2, 3, 4, 5, 6	-	·104				
N <sub>oc</sub> Note2	dBm/SCS	1, 2, 4, 5	-104 -101					
		3, 6						
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	116	70				
Ê <sub>s</sub> /I <sub>ot</sub> Note3	dB	1, 2, 3, 4, 5, 6	116	70				
SS-RSRP <sup>Note3</sup>	dBm/SCS	1, 2, 4, 5	88	104				
		3, 6	85	101				
SSB_RP <sup>Note3</sup>	dBm/SCS	1, 2, 4, 5	88	104				
		3, 6	85	101				
	dBm/9.36	1, 2, 4, 5	59.94	73.04				
IoNote3	MHz							
10	dBm/38.16	3, 6	53.84	66.93				
	MHz							
Propagation condition		1, 2, 3, 4, 5, 6	ET	DLA30				
Antenna Configuration and Correlation		1, 2, 3, 4, 5, 6	1x2 Low					
Matrix								
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power								

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.6.3.2.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
·		4, 5, 6	TDD	
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6	
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1	
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> =	25
			10 MHz: N <sub>RB,c</sub> =	= 50
			20 MHz: N <sub>RB,c</sub> =	100
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FI	DD
DL Reference Measurement			10 MHz: R.3 F	DD
Channel <sup>Note2</sup>			20 MHz: R.6 F	DD
		4, 5, 6	5 MHz: R.4 TI	OD
		, .	10 MHz: R.0 T	DD
			20 MHz: R.3 T	DD

PCFICH/PDCCH/PHICH parameters: DL Reference Measurement		1, 2, 3	5 MHz: R.11 10 MHz: R.6 20 MHz: R.1	6 FDD				
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.1					
Gridinion		4, 5, 6	10 MHz: R.6					
			20 MHz: R.10 TDD					
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.2					
		, , -	10 MHz: OP.	10 FDD				
			20 MHz: OP.	17 FDD				
		4, 5, 6	5 MHz: OP.	9 TDD				
			10 MHz: OP.	1 TDD				
			20 MHz: OP.	7 TDD				
PBCH_RA								
PBCH_RB								
PSS_RA								
SSS_RA								
PCFICH_RB								
PHICH_RA								
PHICH_RB	dB	1, 2, 3, 4, 5, 6	0					
PDCCH_RA								
PDCCH_RB								
PDSCH_RA								
PDSCH_RB								
OCNG_RA <sup>Note3</sup>								
OCNG_RB <sup>Note3</sup>								
N <sub>oc</sub> <sup>Note4</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-104					
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	17				
Ê <sub>s</sub> /I <sub>ot</sub> Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17				
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87				
SCH_RP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87				
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50)	-59.13+10log (N <sub>RB,c</sub> /50)				
Propagation Condition Note6		1, 2, 3, 4, 5, 6	,					
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Lov	N				
Correlation Matrix Note6								

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.
- Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

# A.6.6.3.2.2 Test Requirements

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.6.6.4 L1-RSRP measurement for beam reporting

# A.6.6.4.1 SSB based L1-RSRP measurement when DRX is not used

Editor's Note: to be added based on A.4.6.3.1.

## A.6.6.4.2 SSB based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.6.6.3.1.

### A.6.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

Editor's Note: to be added based on A.4.6.3.3.

#### A.6.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.6.6.3.3.

# A.6.7 Measurement Performance requirements

# A.6.7.1 SS-RSRP

# A.6.7.1.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

# A.6.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.1.1 and 10.1.2.1.2 for intra frequency measurements.

### A.6.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra frequency measurements are tested by using the parameters in A.6.7.1.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 the target cell.

Table A.6.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.6.7.1.1.2-2: SS-RSRP Intra frequency test parameters

Parameter		Unit	Tes	st 1	Tes	st 2	Tes	st 3
		Offic	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Cell ID			T489	T0	T489	T0	T489	T0
SSB ARFCN			freq1 freq1		q1	freq1		
Duplex mode	Config 1		FDD					
Duplex mode	Config 2,3	TDD						
	Config 1		Not Applicable					
TDD configuration	Config 2	TDDConf.1.1						
	Config 3				TDDC	onf.2.1		

	Config 1				10: N <sub>RB</sub>	s.c = 52				
BW <sub>channel</sub>	Config 2	MHz			10: N <sub>RB</sub>					
	Config 3		40: N <sub>RB,c</sub> = 106							
	Config 1		10: N <sub>RB,c</sub> = 52							
BWP BW	Config 2				10: N <sub>RE</sub>					
	Config 3		40: N <sub>RB,c</sub> = 106							
Downlink initial BWP cor					DLBW					
Downlink dedicated BWI					DLBW	P.1.1				
Uplink initial BWP config	uration				ULBW	P.0.1				
Uplink dedicated BWP c					ULBW	P.1.1				
TRS configuration	Config 1		TRS.1. 1 FDD	NA	TRS.1 .1 FDD	NA	TRS.1. 1 FDD	NA		
	Config 2		TRS.1. 1 TDD	NA	TRS.1 .1 TDD	NA	TRS.1. 1 TDD	NA		
	Config 3		TRS.1. 2 TDD	NA	TRS.1 .2 TDD	NA	TRS.1. 2 TDD	NA		
DRX Cycle		ms	Not Applicable							
	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD			
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-		
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD			
	Config 1		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD			
RMSI CORESET Reference Channel	Config 2		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-		
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD			
	Config 1		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD			
Control channel RMC	Config 2		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-		
	Config 3		CCR2.1 TDD		CCR2. 1 TDD		CCR2.1 TDD			
	Config 1		SSB 1 FR1		SSB 1 FR1		SSB 1 FR1			
SSB configuration	Config 2		SSB 1 FR1	-	SSB 1 FR1	-	SSB 1 FR1	-		
	Config 3		SSB 2 FR1		SSB 2 FR1		SSB 2 FR1			

SSB configuration			Confin 4		SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	
Config 2			Config 1			FR1					
Time offset with Cell 2  Config 1  SMTC configuration  Config 2,3  SMTC configuration  Config 2,3  SMTC configuration  Config 2,3  SMTC.1  Config 1  Config 2,3  SMTC.1  Config 1  Config 2,3  SMTC.1  Config 1  Config 2,3  SMTC.1  Config 1  Config 2,3  SMTC.1  Config 1  Config 2,3  SMTC.1  Config 1  Config 2,3  SMTC.1  Config 2,3  SMTC.1  Config 3  EPBE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PDCCH In PBCH DMRS  EPRE ratio of PDCCH In PBCH DMRS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG to CONG DMRS (tote 1)  NR_FDD_FR1_A,  NR_FDD_FR1_A,  NR_FDD_FR1_B,	SSB config	guration	Config 2								
Time offset with Cell 2   Config 2.3   μs   - 3   -			Config 3		SSB.2	SSB.2	SSB.2	SSB.2	SSB.2	SSB.2	
SMTC configuration	SMTC configuration  OCNG Patterns  PDSCH/PDCCH subcarrier spacing  EPRE ratio of PSS to SS EPRE ratio of PBCH DM EPRE ratio of PBCH to FE EPRE ratio of PDCCH D		Config 1	ms	-	3	-	3	-	3	
SMTC conliguration	Time onse	t with Oen 2	Config 2,3	μs	-	3	-	3	-	3	
Config 1,2   SMTC.1	SMTC con	SMTC configuration			SMTC.2						
PDSCH/PDCCH   Config 1,2   Config 3   RHz   30kHz	CIII 7 C CCI		Config 2,3				SMT	TC.1			
Subcarifier Spacing   Config 3   Config 3   Config 3   SHz	OCNG Pat	terns	1				OCNG p	attern 1			
Subcarrier spacing			_	kHz			15	кНz			
EPRE ratio of PBCH DMRS to SSS   EPRE ratio of PDCCH to PBCH DMRS   EPRE ratio of PDCCH DMRS to SSS   EPRE ratio of PDCCH DMRS to SSS   EPRE ratio of PDCCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH to PDSCH   EPRE ratio of PDSCH to PDSCH   EPRE ratio of PDSCH to PDSCH   EPRE ratio of PDSCH to PDSCH   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to SSS   EPRE ratio of PDSCH DMRS to EPRE ratio of PDSCH DMRS to PDSCH		· -	ŭ .	11.12			30k	Hz	_		
EPRE ratio of PBCH to PBCH DMRS											
EPRE ratio of PDCCH DMRS to SSS   EPRE ratio of PDCCH to PDCCH DMRS   EPRE ratio of PDSCH to PDSCH DMRS to SSS   EPRE ratio of PDSCH to PDSCH DMRS to SSS   EPRE ratio of PDSCH to PDSCH   EPRE ratio of OCNG DMRS (Note 1)											
EPRE ratio of PDSCH DMRS to SSS	EPRE ratio	of PDCCH D	MRS to SSS						0		
EPRE ratio of PDSCH to PDSCH EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG bMRS to SSS(Note 1) EPRE ratio of OCNG bMRS to SSS(Note 1)  I				dB	0	0	0	0		0	
EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)				-							
Reference   Refe											
1)											
NR_TDD_FR1_A   NR_FDD_FR1_B   NR_TDD_FR1_C   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_TDD_FR1_C   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_C   NR_FDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_FDD_FR1_B   NR_F			,								
NR_FDD_FR1_B   NR_FDD_FR1_C   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_E   NR_F											
NR_TDD_FR1_C   NR_FDD_FR1_D   NR_TDD_FR1_D   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_B   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_F		Config 1,2			-106		-88		-1	16	
Config 1,2    NR_FDD_FR1_D, NR_TDD_FR1_B, NR_FDD_FR1_E, NR_FDD_FR1_E, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_B, NR_FDD_FR1_E, NR_FDD_FR1_B, NR											
NR_TDD_FR1_D   NR_FDD_FR1_E   NR_TDD_FR1_G   NR_FDD_FR1_G   NR_FDD_FR1_G   NR_FDD_FR1_B   NR_TDD_FR1_C   NR_TDD_FR1_C   NR_TDD_FR1_C   NR_TDD_FR1_C   NR_TDD_FR1_E   NR_TDD_FR1_E   NR_TDD_FR1_E   NR_TDD_FR1_E   NR_TDD_FR1_E   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_C   NR_F									-115		
NR_FDD_FR1_E, NR_TDD_FR1_E   NR_FDD_FR1_G   NR_FDD_FR1_G   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B   NR_TDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_B   NR_TDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_H									-11/1.5		
NR_TDD_FR1_E   NR_FDD_FR1_G   NR_FDD_FR1_B   NR_TDD_FR1_A   NR_TDD_FR1_B   NR_TDD_FR1_C   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_TDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_FDD_FR1_B   NR_TDD_FR1_B   NR_T								-114.5			
NR_FDD_FR1_H   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_A   NR_FDD_FR1_B     NR_FDD_FR1_B   NR_FDD_FR1_C   NR_FDD_FR1_C     NR_FDD_FR1_B   NR_FDD_FR1_B     NR_FDD_FR1_B   NR_FDD_FR1_B     NR_FDD_FR1_B   NR_FDD_FR1_B     NR_FDD_FR1_B   NR_FDD_FR1_A     NR_FDD_FR1_B   NR_FDD_FR1_B									-114		
Note2  NR_FDD_FR1_A NR_FDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_FDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H  Config 1,2  Config 3  NR_FDD_FR1_A NR_FDD_FR1_A NR_FDD_FR1_A NR_FDD_FR1_A NR_FDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_B N	N			dBm/15Kh					-113		
NR_TDD_FR1_A   NR_FDD_FR1_B   NR_TDD_FR1_C									-11	2.5	
NR_FDD_FR1_B   NR_TDD_FR1_C   NR_FDD_FR1_D   NR_FDD_FR1_D									_1	16	
NR_TDD_FR1_C					-113		-94				
Config 3  NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H  Config 1,2  Config 1,2  NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_C Note2  Config 3  Config 3  NR_FDD_FR1_D, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G  NR_FDD_FR1_E NR_FDD_FR1_G  NR_FDD_FR1_E NR_FDD_FR1_G  NR_FDD_FR1_E NR_FDD_FR1_G  NR_FDD_FR1_E NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_C NR_FDD			•								
NR_IDD_FR1_E     NR_FDD_FR1_E     NR_FDD_FR1_G     NR_FDD_FR1_H     NR_FDD_FR1_A     NR_FDD_FR1_B     NR_FDD_FR1_B     NR_FDD_FR1_B     NR_FDD_FR1_D     NR_FDD_FR1_D     NR_FDD_FR1_D     NR_FDD_FR1_E     NR_F		Config 3									
NR_TDD_FR1_E   NR_FDD_FR1_G   NR_FDD_FR1_H									-114.5		
NR_FDD_FR1_G   NR_FDD_FR1_H									-114		
Name of the imag											
Noches  Nager Description of the property of t											
Note2  NR_FDD_FR1_A, NR_TDD_FR1_B NR_FDD_FR1_C NOte2  NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_E NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G  NR_FDD_FR1_G		Config 1,2			-10	06	-8	38			
Note2   NR_FDD_FR1_B   NR_TDD_FR1_C   NR_FDD_FR1_D   NR_FDD_FR1_D   NR_FDD_FR1_E   NR_TDD_FR1_E   NR_FDD_FR1_E   NR_FDD_FR1_G   NR_FDD_FR1_				1							
Note2       NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G       dBm/SCS       -110       -91       -111.5         -111       -111       -111       -111			•								
Note2 Config 3 NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G -110	N										
NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G -110 -91 -111.5 -111 -110		0		dBm/SCS		10	,	24	-1	14	
NR_TDD_FR1_E -111 NR_FDD_FR1_G -110		Config 3	NR_TDD_FR1_D		-1	IU	-91		-11	1.5	
NR_FDD_FR1_G -110										4.4	
				-							

$\hat{\mathbf{E}}/\mathbf{I}_{\mathrm{ot}}$			dB	2.5	-6	2.5	-6	0.46	-5.76
$\hat{E}/N_{\!oc}$			dB	6	1	6	1	3	-1
SS- RSRP <sup>Not</sup> e3	Config 1,2	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/SCS	-100	-105	-82	-87	-113 -112.5 -112 -111.5 -111 -110 -109.5	-117 -116.5 -116 -115.5 -115 -114 -113.5
	Config 3	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H	abm/SCS	-106	-109	-85	-90	-110 -109.5 109 - 108.55 -108 -107 -106.5	-114 -113.5 -113 -112.5 -112 -111 -110.5
Io <sup>Note3</sup>	Config 1,2	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 9.36MHz	-70	.09	-52	-52.09		.26 .76 .26 .76 .26 .26
	Config 3	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 38.16MHz	-70	.99	-51	.99	-76 -75 -75 -74 -74	.16 .66 .16
Propagation	on condition		-		AWGN				
Antenna c	onfiguration		!!	L		1x	(2		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.6.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

### A.6.7.1.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.4.1.1 and 10.1.4.1.2 for intra frequency measurements with the testing configurations for NR cells in Table A.6.7.1.2.1-1.

Table A.6.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

### A.6.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.6.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP intra frequency measurements are tested by using the parameters in Table A.6.7.1.2.2-1. The inter frequency measurements are supported by a measurement gap.

Table A.6.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Parameter	Confin	Unit	Test 1		Test 2		
Parameter	Config	Unit	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN	1~3		freq1	freq2	freq1	freq2	
	1		10: N <sub>RB,c</sub> =	= 52	10: N <sub>RB,0</sub>	= 52	
BWchannel	2	MHz	10: N <sub>RB,c</sub> =	= 52	10: N <sub>RB,0</sub>	= 52	
	3		40: N <sub>RB,c</sub> =	106	40: N <sub>RB,c</sub>	= 106	
	1		FDD		FDE	)	
Duplex mode	2		TDD		TDE	)	
	3		TDD		TDE	)	
	1		N/A		N/A		
TDD configuration	2		TDDConf	.1.1	TDDCor	nf.1.1	
	3		TDDConf	.2.1	TDDConf.2.1		
PDSCH Reference	1		SR.1.1 FDD		SR.1.1 FDD		
measurement channel	2		SR.1.1 TDD	-	SR.1.1 TDD	-	
measurement channel	3		SR.2.1 FDD		SR.2.1 FDD		
RMSI CORESET Reference	1		CR.1.1 FDD	-	CR.1.1 FDD	-	
Channel	2		CR.1.1 TDD	-	CR.1.1 TDD	-	
Chamilei	3		CR.2.1 FDD	-	CR.2.1 FDD	-	
Dedicated CORESET	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	
Reference Channel	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-	
Reference Charmer	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-	
	1		SSB.1 F	R1	SSB.1	FR1	
SSB configuration	2		SSB.1 F	R1	SSB.1	FR1	
	3		SSB.2 F	R1	SSB.2	FR1	
OCNG Patterns	1~3		OP.1		OP.	1	
TRS configuration	1		TRS.1.1 FDD		TRS.1.1 FDD		
TNO COMINGUIACION	2		TRS.1.1 TDD	-	TRS.1.1 TDD		

		3		TRS.1.2 TDD		TRS.1.2	
Initial BWP	Configuration	1~3		DLBWP.	-	DLBWF	
	BWP configuration	1~3		ULBWP.	1.1	ULBWP.0.1 DLBWP.1.1	
				ULBWP.1.1 SMTC.1		ULBWF	
SMTC conf	between Cell 1	1~3			1	SMTC	J. T
and Cell 2		1~3	μs	3	I	3	Π
	of PSS to SSS of PBCH DMRS to						
SSS EPRE ratio o	of PBCH to PBCH						
DMRS	of PDCCH DMRS to					0	
SSS							
DMRS	f PDCCH to PDCCH	1~3	dB	0	0		0
SSS	of PDSCH DMRS to						
EPRE ratio o	f PDSCH to PDSCH						
	of OCNG DMRS to	]					
	f OCNG to OCNG						
DIVIRS	NR_FDD_FR1_A,						4.47
	NR_TDD_FR1_A, NR_SDL_FR1_A						-117
$N_{oc}$ Note2	NR_FDD_FR1_B NR_TDD_FR1_C		-ID /4.5	04.05		$(N_{oc})$ for	-116.5 -116
	NR_FDD_FR1_D, NR_TDD_FR1_D	1~3	dBm/15 kHz	-94.65		Channel 2	-115.5
	NR_FDD_FR1_E, NR_TDD_FR1_E					+8dB)	-115
	NR_FDD_FR1_G						-114
	NR_FDD_FR1_H NR_FDD_FR1_A,	1					-113.5
	NR_TDD_FR1_A, NR_SDL_FR1_A						-117
	NR_FDD_FR1_B					, M	-116.5
	NR_TDD_FR1_C NR_FDD_FR1_D,	1,2,4,5		-94.65	;	( $N_{oc}$ for Channel 2	-116 -115.5
	NR_TDD_FR1_D NR_FDD_FR1_E,					+8dB)	-115
	NR_TDD_FR1_E NR_FDD_FR1_G						-114
$N_{oc}$ Note2	NR_FDD_FR1_H NR_FDD_FR1_A,		dBm/SS				-113.5
	NR_TDD_FR1_A,		B SCS				-114
	NR_SDL_FR1_A NR_FDD_FR1_B						-113.5
	NR_TDD_FR1_C NR_FDD_FR1_D,	3		-91.65		$(N_{oc} \text{ for}$	-113
	NR_TDD_FR1_D NR_FDD_FR1_E,					Channel 2 +8dB)	-112.5
NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G							-112 -111
NR_FDD_FR1_H							-110.5
	$\mathbf{\hat{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	1~3	dB	10	10	13	-4
00	NR_FDD_FR1_A, NR_TDD_FR1_A,		4D /CC		_	(RSRP for	-121
SS- RSRP <sup>Note3</sup>	NR_SDL_FR1_A NR_FDD_FR1_B	1,2,4,5	dBm/SC S	-84.65		Cell 2 +25dB)	-120.5
	NR_TDD_FR1_C					12300)	-120

	NR_FDD_FR1_D,						-119.5
	NR_TDD_FR1_D NR_FDD_FR1_E,						
	NR_TDD_FR1_E						-119
	NR_FDD_FR1_G						-118
	NR_FDD_FR1_H						-117.5
	NR_FDD_FR1_A,						
	NR_TDD_FR1_A,						-124
	NR_SDL_FR1_A NR_FDD_FR1_B						-123.5
	NR TDD FR1 C					(RSRP for	-123.3
	NR_TDD_FR1_C NR_FDD_FR1_D,	3		-81.65		Cell 2	
	NR_TDD_FR1_D			-01.03		+25dB)	-122.5
	NR_FDD_FR1_E,					12002)	-122
	NR_TDD_FR1_E						-122
	NR_FDD_FR1_G						
	NR_FDD_FR1_H						-120.5
	NR_FDD_FR1_A,						07.70
	NR_TDD_FR1_A, NR_SDL_FR1_A						-87.76
	NR_FDD_FR1_B						-87.26
-	NR_TDD_FR1_C		dBm/			Io for	-86.76
	NR FDD FR1 D,	1,2,4,5	9.36MH z	-56.28		Channel 2	
	NR_TDD_FR1_D			00.20		+19.75dB)T	-86.26
	NR_FDD_FR1_E,						-85.76
	NR_TDD_FR1_E						
	NR_FDD_FR1_G						-84.76
lo <sup>Note3</sup>	NR_FDD_FR1_H						-84.26
	NR_FDD_FR1_A, NR_TDD_FR1_A,						-84.76
	NR_SDL_FR1_A,						-04.70
	NR_FDD_FR1_B						-84.26
	NR_TDD_FR1_C		dBm/			Io for	-83.76
	NR FDD FR1 D,	3	38.16M	-50.19		Channel 2	
	NR_TDD_FR1_D		Hz			+19.75dB)T	-83.26
	NR_FDD_FR1_E,						-82.76
	NR_TDD_FR1_E						
	NR_FDD_FR1_G						-81.76
	NR_FDD_FR1_H						-81.26
	$\hat{E}_s/N_{oc}$	1~3	dB	10	10	T13	T-4
	gation condition	1~3	-	AWGN		AWG	iN

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.6.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the Absolute requirement in clause 10.1.4.1.1 and Relative requirement in clause 10.1.4.1.2.

#### A.6.7.1.3 Void

#### A.6.7.2 SS-RSRQ

# A.6.7.2.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

#### A.6.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.6.7.2.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

Table A.6.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.6.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

Danama	-t	Unit	Tes	st 1	Test 2		Test 3	
Parame	eter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			freq1 freq1 frec				q1	
Duplex mode	Config 1			FDD				
Duplex mode	Config 2,3		TDD					
	Config 1		Not Applicable					
TDD configuration	Config 2				TDDCo	nf.1.1		
	Config 3				TDDCo	nf.2.1		
	Config 1				10: N <sub>RB</sub>	c = 52		
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52					
	Config 3		40: N <sub>RB,c</sub> = 106					
	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP				DLBW	P.1.1		
BWP configuration	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP				ULBW	P.1.1		
DRX Cycle		ms			Not App	licable		
	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	

		Config 1		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD		
RMSI COF Reference		Config 2		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD		
		Config 3		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD		
		Config 1		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1 .1 FDD		
Control Ch	annel RMC	Config 2		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1 .1 TDD	-	
		Config 3		CCR.2. 1 TDD		CCR.2. 1 TDD		CCR.2 .1 TDD		
OCNG Pat	OCNG Patterns					OP.	1			
SS-RSSI-N	/leasurement					Not App	licable			
SMTC con	figuration					SMT				
SW1 6 5611	nguranori	Config 1,2				SSB.1				
SSB config	guration									
		Config 3				SSB.2	FR1			
PDSCH/PI	DCCH	Config 1,2	kHz			15 k	Hz			
subcarrier	subcarrier spacing Config 3		NIIZ			30kl	Hz			
EPRE ratio	EPRE ratio of PSS to SSS									
	of PBCH DMRS									
	of PBCH to PBC				0					
EPRE ratio	of PDCCH DMF of PDCCH to PI	KS 10 SSS DCCH DMBS	dB	0		0	0	0	0	
	of PDSCH DMF		QD.	U	U	U	U	0	U	
	of PDSCH to PI									
EPRE ratio	of OCNG DMRS	S to SSS(Note 1)								
EPRE ratio	of OCNG to OC	CNG DMRS (Note 1)								
		NR_FDD_FR1_A, NR_TDD_FR1_A						[-1	20]	
		NR_FDD_FR1_B						[-11	9.5]	
		NR_TDD_FR1_C	1						19]	
Note2		NR_FDD_FR1_D,	dBm/15kH						8.5]	
N oc Note2		NR_TDD_FR1_D		-9	-91		[-110.05]			
		NR_FDD_FR1_E,						[-118]		
		NR_TDD_FR1_E	ļ							
		NR_FDD_FR1_G							17]	
		NR_FDD_FR1_H							6.5]	
	Config 1,2			-9	)1	[-110	0.05]		as Noc 5 kHz	
		NR_FDD_FR1_A,					-	[_1	17]	
		NR_TDD_FR1_A								
		NR_FDD_FR1_B							6.5]	
N oc Note2		NR_TDD_FR1_C	dBm/SCS					[-1	16]	
Notez	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D		-8	88	[-107	7.05]	[-11	5.5]	
		NR_FDD_FR1_E,	-					[_1	15]	
		NR_TDD_FR1_E								
		NR_FDD_FR1_G	_						[-114]	
	NR_FDD_FR1_H		dB		76		7		3.5]	
$\frac{E_s/I_{ot}}{\hat{E}_s/N_{oc}}$	$\hat{\mathbf{E}}_{s}/\mathbf{I}_{ot}$			-1. 3	76 3	-4 -2.9	-2.9	-546 -4	-5.46 -4	
L <sub>s</sub> /IV <sub>oc</sub>	Config 1,2	NR_FDD_FR1_A,	dB dBm/SCS	-88	-88	-2.3	-2.3	[-124]	- <del>4</del> [-124]	
	55.mg 1,2	NR_TDD_FR1_A	42/11/000		55			[ ']	ر ۱۳۰۰	

SS- RSRP <sup>Not</sup> e3		NR_FDD_FR1_B  NR_TDD_FR1_C  NR_FDD_FR1_D, NR_TDD_FR1_D  NR_FDD_FR1_E, NR_TDD_FR1_E  NR_FDD_FR1_H  NR_FDD_FR1_A, NR_TDD_FR1_A  NR_FDD_FR1_B  NR_FDD_FR1_B  NR_FDD_FR1_B  NR_FDD_FR1_B				[- 112.95 ]	[- 112.95 ]	[- 123.5] [-123] [- 122.5] [-122] [-121] [- 120.5] [-121] [- 120.5] [-120]	[- 123.5] [-123] [- 122.5] [-122] [-121] [- 120.5] [-121] [- 120.5] [-120] [-120]
	Config 3	NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H		-85	-85	109.95 ]	109.95	119.5] [-119] [-118] [- 117.5]	119.5] [-119] [-118] [- 117.5]
SS-RSRQ	Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dB	-14.77	-14.77	-16.76	-16.76	[- 17.34	[- 17.34]
Io <sup>Note3</sup>	Config 1,2	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 9.36MHz	-5	66	[-7	[-79]		9.5] 39] 3.5] 38] 7.5] 6.5]
	Config 3	NR_FDD_FR1_A, NR_TDD_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/ 38.16MHz	-50	.00	[-7	[3]	[-82 [-82 [-81 [-81	.41] .91] .41] .41] .41]
Propagation	n condition		-	AWGN	AWGN	AWGN	AWGN	AWG N	AWG N
Antenna co	onfiguration			1x2	1x2	1x2	1x2	1x2	1x2

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at
	each receiver antenna port.
Note 5:	NR operating band groups are as defined in clause 3.5.2.

#### A.6.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

## A.6.7.2.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.1.1 and 10.1.9.1.2.

#### A.6.7.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 alnd Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.6.7.2.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

Table A.6.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only i	required to be tested in one of the supported test configurations

Table A.6.7.2.2.2-2: SS-RSRQ Inter frequency test parameters

Param	otor	Unit	Те	st 1	Tes	st 2	Tes	st 3	
Palali	ietei	Offic	TDI Not Appl TDDCo TDDCo TDDCo 10: NRB, MHz 10: NRB,	Cell 2	Cell 1	Cell 2			
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2	
Duplex mode	Config 1		FDD						
Duplex mode	Config 2,3		TDD						
	Config 1				Not App	licable			
TDD configuration	Config 2				TDDCc	onf.1.1			
	Config 3				TDDCc	onf.2.1			
	Config 1				10: N <sub>RB</sub>	,c = 52			
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52						
	Config 3		40: N <sub>RB,c</sub> = 106						
	Config 1				10: N <sub>RB</sub>	,c = 52			
BWP BW	Config 2				10: N <sub>RB</sub>	,c = 52			
	Config 3				40: NRB	,c = 106	•	·	
DRX Cycle		ms	Not Applicable					·	

		Config 1,4		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
		Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-
	SMTC configuration  SSB configuration  PDSCH/PDCCH subcarrier spacing  EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMR  EPRE ratio of PBCH to PE  EPRE ratio of PDCCH to PE  EPRE ratio of PDCCH to PE  EPRE ratio of PDSCH DM  EPRE ratio of PDSCH DM  EPRE ratio of PDSCH DM  EPRE ratio of OCNG DMF  EPRE ratio of OCNG DMF  EPRE ratio of OCNG to O	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
		Config 1		CR.1.1 FDD	-	R.1.1 FDD	-	CR.1.1 FDD	
		Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
		Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
		Config 1		CCR.1 .1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD	
		Config 2		CCR.1 .1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-
		Config 3		CCR2. 1 TDD		CCR2.1 TDD		CCR2. 1 TDD	
OCNG Pat	OCNG Patterns					OCNG p	attern 1		
		Config 1,2				SMTC p			
SMTC con	Config 3		-			SMTC p			
000			1			SSB patter		1	
SSB confi	Config 3			SSB pattern 2 in FR1					
PDSCH/PI	PDSCH/PDCCH Config 1,2					15 k	κHz		
		Config 3	kHz			30 k	Hz		
EPRE ratio	of PSS to SSS	-							
EPRE ratio	of PBCH DMRS								
			-						
EPRE ratio	of PDCCH DIVIR	OCCH DMRS	dB	0	0	0	0	0	0
EPRE ratio	of PDSCH DMR	S to SSS	]						ŭ
EPRE ratio	of OCNG DMRS	S to SSS(Note 1)	1						
LI IXL IAIIO		NR_FDD_FR1_A							
		NR_TDD_FR1_A							
		NR_SDL_FR1_A						-11	
		NR_FDD_FR1_B	-					-11	
$N_{oc}$	Config 1.2	NR_TDD_FR1_C NR_FDD_FR1_D	dBm/15kHz	0.0	0.18	-10	ne	-11	5
Note2	Coming 1,2	NR_TDD_FR1_D	UDIII/ IOKHZ	-00	J. 10	-10	06	-114	1.5
		NR_FDD_FR1_E	-						1.0
		NR_TDD_FR1_E						-11	4
		NR_FDD_FR1_G						-11	
		NR_FDD_FR1_H						-112	2.5
		NR_FDD_FR1_A NR_TDD_FR1_A							
		NR_SDL_FR1_A						-11	16
		NR_FDD_FR1_B	1					-11	
$N_{oc}$	Config 3	NR_TDD_FR1_C	dBm/15kHz	-96	6.27	-1	13	-11	5
Note2	Joining 5	NR_FDD_FR1_D	GDIII/ IONI IZ	-50	<i>∟</i> 1	-1			
		NR_TDD_FR1_D	-					-114	4.5
		NR_FDD_FR1_E NR_TDD_FR1_E						-11	4
		NR_FDD_FR1_G						-11	

		NR_FDD_FR1_H						-11:	2.5
		NR_FDD_FR1_A						-112	2.0
		NR_TDD_FR1_A							
		NR_SDL_FR1_A						-11	16
		NR_FDD_FR1_B				-106		-115.5	
		NR_TDD_FR1_C						-115	
	Config 1,2	NR_FDD_FR1_D		-80	0.18				
	0 sg .,_	NR_TDD_FR1_D			J. 10			-114	4.5
		NR_FDD_FR1_E							1.0
		NR_TDD_FR1_E	- dBm/15kHz					-11	14
		NR_FDD_FR1_G						-11	
$N_{oc}$		NR_FDD_FR1_H						-11:	
Note2		NR_FDD_FR1_A	dBm/15kHz						
		NR_TDD_FR1_A							
		NR_SDL_FR1_A						-11	13
		NR_FDD_FR1_B	1					-112	2.5
		NR_TDD_FR1_C	1					-11	12
	Config 3	NR_FDD_FR1_D		-83	3.27	-1	10		
	_	NR_TDD_FR1_D						-11	1.5
		NR_FDD_FR1_E							
		NR_TDD_FR1_E	_					-11	11
		NR_FDD_FR1_G						-11	10
		NR_FDD_FR1_H						-109	9.5
$\hat{\mathbf{E}}_{s}/\mathbf{I}_{ot}$			dB	-1	.75	-1.	75	3	-1.75
$\hat{E}_s/N_{oc}$			dB	-1	-1.75 -1.75		3	-1.75	
		NR_FDD_FR1_A							_
		NR_TDD_FR1_A							117.7
		NR_SDL_FR1_A						-113	5
									-
		NR_FDD_FR1_B	-					-112.5	117.2 5
								-112.0	-
		NR_TDD_FR1_C		-81.93					116.7
						-81.93 107.75	107.75	-112	5
	Confin 1 0	NR_FDD_FR1_D			-81 03				-
	Config 1,2	NR_TDD_FR1_D			-01.93			444.5	116.2
			-					-111.5	5
		NR_FDD_FR1_E							115.7
		NR_TDD_FR1_E						-111	5
									-
SS-		NR_FDD_FR1_G						440	114.7
RSRP <sup>Not</sup>			dBm/SCS					-110	5
e3		NR_FDD_FR1_H							114.2
		1111_1 00_1 111_11						-109.5	5
		NR_FDD_FR1_A							_
		NR_TDD_FR1_A							114.7
		NR_SDL_FR1_A						-110	5
		ND EDE 55: 5							-
		NR_FDD_FR1_B						100 F	114.2
								-109.5	5 -
	Config 3	NR_TDD_FR1_C		-85.02	-85.02	- 111.75	- 111.75		113.7
	_	_ '				111./5	111./5	-109	5
		NR_FDD_FR1_D							-
		NR_TDD_FR1_D						-100 E	113.2
								-108.5	5
		NR_FDD_FR1_E							112.7
		NR_TDD_FR1_E						-108	5

-									
		NR_FDD_FR1_G						-107	- 111.7 5
		NR_FDD_FR1_H						-106.5	- 111.2 5
	NR_FDD NR_TDD NR_SDL								
SS-RSRQ <sup>Note3</sup>		NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D	dB	-14.77	-14.77	-40.59	-40.59	12.56T	14.76 T
		NR_TDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G							
		NR_FDD_FR1_H							
		NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A						-83.28	- 85.83
		NR_FDD_FR1_B						-82.78	- 85.33
		NR_TDD_FR1_C						-82.28	- 84.83
	Config 1,2	NR_FDD_FR1_D NR_TDD_FR1_D	- -	-50		-75.83		-81.78	- 84.33
		NR_FDD_FR1_E NR_TDD_FR1_E						-81.28	- 83.83
		NR_FDD_FR1_G						-80.28	- 82.83
Io <sup>Note3</sup>		NR_FDD_FR1_H	dBm/SCS					-79.78	- 82.33
IO. reces		NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A	dbii/SCS					-77.19	- 79.73
		NR_FDD_FR1_B						-76.69	- 79.23
		NR_TDD_FR1_C						-76.19	- 78.73
	Config 3	NR_FDD_FR1_D NR_TDD_FR1_D			50	-76	.73	-75.69	- 78.23
		NR_FDD_FR1_E NR_TDD_FR1_E						-75.19	- 77.73
		NR_FDD_FR1_G						-74.19	- 76.73
		NR_FDD_FR1_H						-73.69	- 76.53
Propagation condition		-	AWG N	AWGN	AWGN	AWGN	AWG N	AWG N	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3.5.2.

#### A.6.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.1.1 and 10.1.9.1.2.

#### A.6.7.3 SS-SINR

### A.6.7.3.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

#### A.6.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.6.7.3.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

Table A.6.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.6.7.3.1.2-2: SS-SINR Intra frequency test parameters

Poro	meter	Unit	Te	Test 1		Test 2		
Faia	meter	Onit	Cell 1	Cell 2	Cell 1	Cell 2		
SSB ARFCN			fre	freq1 freq1				
Duplex mode	Config 1			FDD				
Вирюх точо	Config 2,3		TDD					
	Config 1			Not Ap	plicable			
TDD configuration	Config 2			TDDC	onf.1.1			
	Config 3			TDDC	onf.2.1			
Downlink initial BWP of			DLBV	VP.0.1				
Downlink dedicated B\	Downlink dedicated BWP configuration			DLBV	VP.1.1			
Uplink initial BWP con	Uplink initial BWP configuration			ULBWP.0.1				
Uplink dedicated BWP	configuration		ULBWP.1.1					
DRX Cycle configurati	on	ms		Not Applicable				
TRS configuration	Config 1			TRS.1	.1 FDD			
	Config 2			TRS.1	.1 TDD			
	Config 3			TRS.1.2 TDD				
	Config 1		SR.1.1 FDD		SR.1.1 FDD			
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	_	SR.1.1 TDD	-		
	Config 3		SR.2.1 TDD		SR2.1 TDD			

		Config 1		CR.1.1 FDD		CR.1.1 FDD	
RMSI COF Reference	_	Config 2		CR.1.1 TDD	-	CR.1.1 TDD	
		Config 3		CR.2.1 TDD		CR.2.1 TDD	
		Config 1		CCR.1. 1 FDD		CCR.1.1 FDD	
Dedicated Reference	CORESET Channel	Config 2		CCR.1. 1 TDD	-	CCR.1.1 TDD	-
		Config 3		CCR.2. 1 TDD		CCR.2.1 TDD	
OCNG Pa	tterns				O	P.1	
SS-RSSI-N	Measuremen	t			Not Ap	plicable	
SMTC con	figruation					TC.1	
		Config 1,2				1 FR1	
SSB config	guration	Config 3	-			2 FR1	
	20011	_				5	
PDSCH/PDCCH Config 1,2 Subcarrier spacing Config 3			kHz				
	of PSS to SSS	Config 3				30	
	of PBCH DMR		-				
	of PBCH to PE		1				
	of PDCCH DM			_	_	_	_
	of PDCCH to I of PDSCH DM	PDCCH DMRS	dB	0	0	0	0
	of PDSCH to F		-				
EPRE ratio	of OCNG DMF	RS to SSS(Note 1)					
EPRE ratio	of OCNG to O	CNG DMRS (Note 1)				F 44	101
		NR_FDD_FR1_A, NR_TDD_FR1_A				[-11	اما
		NR_FDD_FR1_B	1			[-11:	5.51
		NR_TDD_FR1_C				[-115.5] [-115] [-114.5]	
N oc Note2		NR_FDD_FR1_D,	dBm/15kH	ſ_(	90]		
oc oc		NR_TDD_FR1_D	z	١,	,0]		
		NR_FDD_FR1_E, NR_TDD_FR1_E				[-11	[4]
		NR FDD FR1 G	-			[-11	131
		NR_FDD_FR1_H	1			[-11:	
	Config 1,2			Γ_(	90]	Same as	-
	Joining 1,2	ND 500 55 : :	_	[-:	امم	15 k	Hz
		NR_FDD_FR1_A,				[-11	13]
		NR_TDD_FR1_A NR_FDD_FR1_B	1			[-11]	
$N_{oc}$		NR TDD FR1 C				[-11	
Note2	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D	dBm/SCS	3-]	37]	[-11	
		NR_FDD_FR1_E,				[-11	  1]
		NR_TDD_FR1_E NR_FDD_FR1_G	-				
		NR FDD FR1 H	1			[-110] [-109.5]	
$\hat{E}_s/I_{ot}$	ı	,	dB	[0]	[-3.19]	[-5.46]	[-5.46]
$\hat{E}_{s}/N_{oc}$			dB	[4.54]	[2.66]	[-4]	[-4]
s / - · oc	Config 1,2	NR_FDD_FR1_A, NR_TDD_FR1_A	dBm/SCS	[- 85.46]	[-87.34]	[-120]	[-120]
					•		

	I	1	1	1	1	1		
		NR_FDD_FR1_B				[-119.5]	[- 119.5]	
		NR_TDD_FR1_C	-			[-119]	[-119]	
		NR_FDD_FR1_D,				[-118.5]	[-	
		NR_TDD_FR1_D NR_FDD_FR1_E,	1			[ ]	118.5]	
		NR_TDD_FR1_E,				[-118]	[-118]	
		NR_FDD_FR1_G				[-117]	[-117]	
		NR_FDD_FR1_H				[-116.5]	[- 116.5]	
SS- RSRP <sup>Not</sup>		NR_FDD_FR1_A,				[-117]	[-117]	
e3		NR_TDD_FR1_A	-			[-116.5]	[-	
		NR_FDD_FR1_B				[ 110.0]	116.5]	
		NR_TDD_FR1_C	<u> </u>			[-116]	[-116]	
	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D		[- 82.46]	[-84.34]	[-115.5]	[- 115.5]	
		NR_FDD_FR1_E,	1			[-115]	[-115]	
		NR_TDD_FR1_E						
		NR_FDD_FR1_G	-			[-114]	[-114]	
		NR_FDD_FR1_H				[-113.5]	[- 113.5]	
		NR_FDD_FR1_A,						
		NR_TDD_FR1_A NR_FDD_FR1_B	1					
		NR TDD FR1 C	-					
	-1-0	NR_FDD_FR1_D,						
SS-SINR N	ote3	NR_TDD_FR1_D	dB	[0]	[-3.19]	[-5.46]	[-5.46]	
		NR_FDD_FR1_E,						
		NR_TDD_FR1_E						
		NR_FDD_FR1_G	-					
		NR_FDD_FR1_H				[-85.	511	
		NR_FDD_FR1_A, NR_TDD_FR1_A				[-65.	51]	
		NR_FDD_FR1_B	-			[-85.	01]	
		NR_TDD_FR1_C				[-84.	51]	
	Config	NR_FDD_FR1_D,	dBm/		4 =1	[-84.	01]	
	1,2	NR_TDD_FR1_D	9.36MHz	[-5	4.5]			
		NR_FDD_FR1_E, NR_TDD_FR1_E				[-83.	51]	
		NR_FDD_FR1_G				[-82.	51]	
Io <sup>Note3</sup>		NR_FDD_FR1_H				[-82.	01]	
		NR_FDD_FR1_A,				[-79.	41]	
		NR_TDD_FR1_A				r 70	041	
		NR_FDD_FR1_B NR_TDD_FR1_C	-			[-78. [-78.		
	0 " 0	NR_FDD_FR1_D,	dBm/		. 441	[-77.		
	Config 3	NR_TDD_FR1_D	38.16MHz	[- <del>4</del> 8	3.41]			
		NR_FDD_FR1_E,				[-77.	41]	
		NR_TDD_FR1_E NR_FDD_FR1_G	1			[_76	<b>4</b> 11	
		NR FDD FR1 H	1			[-76.41] [-75.91]		
Propagatio	n condition		-		AV	/GN		
	onfiguration		-	1x2				

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-SINR, SS-RSRP minimum requirements are specified assuming independent
	interference and noise at each receiver antenna port.
Note 5:	NR operating band groups are as defined in clause 3.5.2.

#### A.6.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

# A.6.7.3.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.14.1.1 and 10.1.14.1.2.

#### A.6.7.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 alnd Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.6.7.3.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

Table A.6.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only	required to be tested in one of the supported test configurations

Table A.6.7.3.2.2-2: SS-SINR Inter frequency test parameters

Parame	otor	Unit	Te	st 1	Test 2		Test 3		
Parame	etei	Onit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2	
Duplex mode	Config 1		FDD						
Duplex mode	Config 2,3			TDD					
	Config 1				Not App	olicable			
TDD configuration	Config 2		TDDConf.1.1						
	Config 3		TDDConf.2.1						
Downlink initial BWP co	nfiguration		DLBWP.0.1						
Downlink dedicated BW	P configuration			DLBWP.1.1					
Uplink initial BWP config	guration			ULBWP.0.1					
Uplink dedicated BWP of	onfiguration			ULBWP.1.1					
DRX Cycle configuration	DRX Cycle configuration			Not Applicable					
TRS configuration	TRS configuration Config 1				TRS.1.	1 FDD			
Config 2			TRS.1.1 TDD						

		Config 3				TRS.1.	2 TDD			
		Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Remeasurem	eference ent channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-	
		Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD		
		Config 1		CR.1.1 FDD	-	R.1.1 FDD	-	CR.1.1 FDD		
RMSI COR Reference	_	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD		
		Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD		
		Config 1		CCR.1 .1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD		
Dedicated Reference	CORESET Channel	Config 2		CCR.1 .1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	
		Config 3		CCR2. 1 TDD		CCR2.1 TDD		CCR2. 1 TDD		
OCNG Pat	terns					OF	P.1			
SS-RSSI-N	SS-RSSI-Measurement					Not App	olicable			
SMTC con	figuration					SMT	C.1			
SSB confi	guration	Config 1,2			SSB.1 FR1					
OOD COM	garation	Config 3		SSB.2 FR1						
PDSCH/PI		Config 1,2	kHz	15						
subcarrier	spacing	Config 3	KI IZ			30				
	of PSS to SSS									
	of PBCH DMRS of PBCH to PBC									
	of PDCCH DMR									
EPRE ratio	of PDCCH to PI	DCCH DMRS	dB	0	0	0	0	0	0	
	of PDSCH DMR									
	of PDSCH to PD									
		S to SSS(Note 1)	-							
EPRE ratio	of OCNG to OC	NG DMRS (Note 1)  NR_FDD_FR1_A								
		NR_TDD_FR1_A						[-119	9.5]	
		NR_SDL_FR1_A NR_FDD_FR1_B	-					[-11	101	
		NR_TDD_FR1_C						[-118		
$N_{oc}$ Note2	Config 1,2	NR_FDD_FR1_D NR_TDD_FR1_D	dBm/15kHz	[-80]		[-10	8.5]	[-11		
,		NR_FDD_FR1_E NR_TDD_FR1_E						[-11	7.5]	
		NR_FDD_FR1_G						[-116.5] [-116]		
		NR_FDD_FR1_H	l	I				[-T	انا	

N oc	Config 1,2 N			[-{	80]	[-108.5]		ame as Noc for 15kHz T		
Note2	Config 3	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/15kHz	[-77]		[-105.5]		[-116.5]  [-116]  [-115.5]  [-115]  [-114.5]  [-114.5]  [-113]		
$\hat{E}_s/I_{ot}$			dB	[-1.75]	[-1.75]	[20]	[20]	[-4.0]	[-4.0]	
$\hat{E}_s/N_{oc}$			dB	[-1.75]		[20]		[-4.0]		
SS-	Config 1,2	NR_FDD_FR1_A     NR_TDD_FR1_A     NR_SDL_FR1_A     NR_FDD_FR1_B     NR_TDD_FR1_C     NR_FDD_FR1_D     NR_TDD_FR1_D     NR_FDD_FR1_E     NR_TDD_FR1_E     NR_FDD_FR1_G		[-81.75]		[-88.5]		[-123.5]  [-123] [-122.5]  [-122]  [-121.5]  [-120.5]  [-120]		
RSRP Note3	Config 3	NR_FDD_FR1_H NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dBm/SCS	[-78	[-78.75]		[-85.5]		[-120.5]  [-120]  [-119.5]  [-119]  [-118.5]  [-117.5]  [-117]	
SS-SINR <sup>Note3</sup> NR_FDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H		dB	[-1	.75]	[2	0]	[-4			

		NR_FDD_FR1_A NR_TDD_FR1_A				[-90.09]			
		NR_SDL_FR1_A NR_FDD_FR1_B				[-89.59]			
		NR_TDD_FR1_C	alD.as/		[-60.5]	[-89.09]			
	Config 1,2	NR_FDD_FR1_D NR_TDD_FR1_D	dBm/ 9.36MHz	[-49.83]		[-88.59]			
		NR_FDD_FR1_E NR_TDD_FR1_E				[-88.09]			
		NR FDD FR1 G				[-87.09]			
I Noto2		NR FDD FR1 H				[-86.59]			
Io <sup>Note3</sup>	Config 3	NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_TDD_FR1_E NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G	dBm/ 38.16MHz	[-43.73]	[-54.41]	[-84] [-83.5] [-83] [-82.5] [-82] [-81]			
Propagatio	n condition	NR_FDD_FR1_H	_		AWGN	[-80.5]			
	Propagation condition Antenna configuration				AVVGN 1x2				
		e used such that both	h cells are fully:	l allocated and a cor	***	ed nower spectral			
		eved for all OFDM sv	•		otan total transmitte	od power spectral			

- density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\infty}$  to be fulfilled.
- SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They Note 3: are not settable parameters themselves.
- SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at Note 4: each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.

#### A.6.7.3.2.3 **Test Requirements**

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

### A.6.7.4 L1-RSRP measurement for beam reporting

#### A.6.7.4.1 SSB based L1-RSRP measurement

#### A.6.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.6.7.4.1.1-1.

Table A.6.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

#### A.6.7.4.1.2 Test parameters

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.6.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters

	Parameter	Config	Unit	Test 1	Test 2
SSB GS	CN	1~3		freq1	freq1
		1		FDD	FDD
Duplex n	node	2		TDD	TDD
		3		TDD	TDD
		1		N/A	N/A
TDD Cor	nfiguration	2		TDDConf.1.1	TDDConf.1.1
	TDD Configuration			TDDConf.2.1	TDDConf.2.1
		1		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BW <sub>channe</sub>	al	2	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
		3		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
DDCCH	Reference	1		SR.1.1 FDD	SR.1.1 FDD
		2		SR.1.1 TDD	SR.1.1 TDD
measurement channel		3		SR.2.1 TDD	SR.2.1 TDD
DMOL O	ODEOET Defende	1		CR.1.1 FDD	CR.1.1 FDD
	ORESET Reference	2	ĺ	CR.1.1 TDD	CR.1.1 TDD
Channel		3		CR.2.1 TDD	CR.2.1 TDD
D !! .	LOODEGET	1		CCR.1.1 FDD	CCR.1.1 FDD
	ed CORESET	2	İ	CCR.1.1 TDD	CCR.1.1 TDD
Reference	ce Channel	3		CCR.2.1 TDD	CCR.2.1 TDD
		1		SSB.3 FR1	SSB.3 FR1
SSB con	figuration	2		SSB.3 FR1	SSB.3 FR1
000	garation	3	1	SSB.4 FR1	SSB.4 FR1
OCNG F	Patterns	1~3		OP.1	OP.1
				DLBWP.0.1	DLBWP.0.1
Initial BV	VP Configuration	1~3		ULBWP.0.1	ULBWP.0.1
		1		TRS.1.1 FDD	TRS.1.1 FDD
TRS con	TRS configuration		1	TRS.1.1 TDD	TRS.1.1 TDD
1110 0011	garation	3	İ	TRS.1.2 TDD	TRS.1.2 TDD
				DLBWP.1.1	DLBWP.1.1
Dedicate	ed BWP configuration	1~3		ULBWP.1.1	ULBWP.1.1
SMTC co	onfiguration	1~3		SMTC.1	SMTC.1
reportCo	onfigType	1~3		periodic	periodic
reportQu		1~3		ssb-Index-RSRP	ssb-Index-RSRP
	of reported RS	1~3		2	2
	P reporting period	1~3		slot80	slot80
	o of PSS to SSS				
	o of PBCH DMRS to SSS				
	o of PBCH to PBCH DMRS				
	o of PDCCH DMRS to SSS o of PDCCH to PDCCH				
DMRS	0 01 PDCCH 10 PDCCH				
	o of PDSCH DMRS to SSS	1~3	dB	0	0
EPRE ratio	EPRE ratio of PDSCH to PDSCH				
	DMRS EPRE ratio of OCNG DMRS to				
SSS <sup>Note 1</sup>					
EPRE ration	o of OCNG to OCNG				
	NR_FDD_FR1_A, NR_TDD_FR1_A				-117
	NR_FDD_FR1_B				-116.5
$N_{oc}$	NR_TDD_FR1_C				-116
Note2	NR_FDD_FR1_D, NR_TDD_FR1_D	1~3	dBm/15kHz	-94.65	-115.5
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				
<u> </u>	NR_FDD_FR1_G				-114

			T	T	
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				-117
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C				-116
	NR_FDD_FR1_D,	1.2		-94.65	-115.5
	NR_TDD_FR1_D	1,2		-94.00	-115.5
	NR_FDD_FR1_E,				445
	NR_TDD_FR1_E				-115
	NR_FDD_FR1_G		-ID (00D		-114
$N_{oc}$	NR_FDD_FR1_H		dBm/SSB		-113.5
Note2	NR_FDD_FR1_A,		SCS		444
	NR_TDD_FR1_A				-114
	NR_FDD_FR1_B				-113.5
	NR TDD FR1 C	1			-114
	NR FDD FR1 D,			04.05	
	NR_TDD_FR1_D	3		-91.65	-112.5
	NR_FDD_FR1_E,	1			
	NR TDD FR1 E				-112
	NR_FDD_FR1_G	1			-111
	NR FDD FR1 H				-110.5
-	· · · · <u>· · · · · · · · · · · · · · ·</u>				
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		1~3	dB	10	-3
	NR_FDD_FR1_A,				400
	NR_TDD_FR1_A	1,2			-120
	NR FDD FR1 B				-119.5
	NR TDD FR1 C				-119
	NR_FDD_FR1_D,			24.0=	440 =
	NR_TDD_FR1_D		dBm/SSB	-84.65	-118.5
	NR_FDD_FR1_E,				110
	NR_TDD_FR1_E				-118
	NR_FDD_FR1_G				-117
SSB	NR FDD FR1 H				-116.5
RSRP	NR_FDD_FR1_A,		SCS		
Note3	NR_TDD_FR1_A				-117
	NR_FDD_FR1_B			-81.65	-116.5
	NR TDD FR1 C				-116
	NR_FDD_FR1_D,				
	NR_TDD_FR1_D	3			-115.5
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				-115
	NR FDD FR1 G	1			-114
	NR_FDD_FR1_H	1			-113.5
	NR_FDD_FR1_A,				
	NR TDD FR1 A				-87.28
	NR_FDD_FR1_B	1			-86.78
	NR_TDD_FR1_C				-86.28
	NR_FDD_FR1_D,		dBm/9.36		
	NR_TDD_FR1_D,	1,2	MHz	-56.28	-85.78
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E,				-85.28
lo Note3	NR FDD FR1 G	-			-84.28
	NR_FDD_FR1_H				-83.78
	NR FDD FR1 A.				-03.10
	NR_FDD_FR1_A,				-81.19
	NR_FDD_FR1_B		dBm/38.16		-80.69
	NR_TDD_FR1_C	3	MHz	-50.19	-80.19
	NR_FDD_FR1_D,	1	1411 12		-00.18
	NR_TDD_FR1_D,				-79.69
	LINU_IDD_LKI_D	1			

	NR_FDD_FR1_E,				-79.19	
	NR_TDD_FR1_E					
	NR_FDD_FR1_G				-78.19	
	NR_FDD_FR1_H				-77.69	
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		dB	10	-3	
Propaga	Propagation condition			AWGN	AWGN	
Note 1:	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total				ant total	
	transmitted power spectral density is achieved for all OFDM symbols.					
Note 2:	Interference from othe				s assumed to be	
	constant over subcarriers and time and shall be modelled as AWGN of appropriate power					
1						

for  $N_{oc}$  to be fulfilled.

Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.6.7.4.1.3 Test Requirements

For at least one reported L1-RSRP during 480ms, the accuracy for SSB#0 and SSB#1 of Cell 1 shall fulfil the requirements in clauses 10.1.19.1.

#### A.6.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

#### A.6.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.6.7.4.2.1-1.

Table A.6.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

	Config	onfig Description			
1		NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode			
2		NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode			
3		NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode			
Note:	Note: The UE is only required to be tested in one of the supported test configurations				

#### A.6.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.6.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~3		freq1	freq1
	1		FDD	FDD
Duplex mode	2		TDD	TDD
•	3	ĺ	TDD	TDD
	1		N/A	N/A
TDD Configuration	2	İ	TDDConf.1.1	TDDConf.1.1
3	3	1	TDDConf.2.1	TDDConf.2.1
	1		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	3		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
PDSCH Reference	1	ļ	SR.1.1 FDD	SR.1.1 FDD
measurement channel	2	ļ	SR.1.1 TDD	SR.1.1 TDD
measurement charmer	3		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference	1	]	CR.1.1 FDD	CR.1.1 FDD
Channel	2	<u> </u>	CR.1.1 TDD	CR.1.1 TDD
Chamer	3		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET	1	<u></u>	CCR.1.1 FDD	CCR.1.1 FDD
Reference Channel	2	J	CCR.1.1 TDD	CCR.1.1 TDD
Reference Charliner	3		CCR.2.1 TDD	CCR.2.1 TDD
	1		SSB.1 FR1	SSB.1 FR1
SSB configuration	2	1	SSB.1 FR1	SSB.1 FR1
, and the second	3		SSB.2 FR1	SSB.2 FR1
OCNG Patterns	1~3		OP.1	OP.1
	1		TRS.1.1 FDD	TRS.1.1 FDD
TRS configuration	2	1	TRS.1.1 TDD	TRS.1.1 TDD
Trib comigaration	3		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1	SMTC.1
Sivi C comigaration	1		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
CSI-RS	2	1	CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
CSI-KS	3	+	CSI-RS 2.2 TDD	CSI-RS 1.2 TDD
reportConfigType	1~3		periodic	periodic
reportQuantity	1~3		cri-RSRP	cri-RSRP
	1~3			2
Number of reported RS L1-RSRP reporting period	1~3		2 slot80	slot80
EPRE ratio of PSS to SSS	1~3		SIULOU	210100
EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS	1~3	dB	0	0
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				
NR_FDD_FR1_A,				-117
NR_TDD_FR1_A				-117
$N_{oc}$ NR_FDD_FR1_B	1~3	dBm/15kHz	04.65	-116.5
Note2 NR_TDD_FR1_C	1~3	ubiii/15KHZ	-94.65	-116
NR_FDD_FR1_D, NR_TDD_FR1_D				-115.5

	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				-113
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				447
	NR_TDD_FR1_A				-117
	NR FDD FR1 B				-116.5
	NR TDD FR1 C				-116
	NR_FDD_FR1_D,	1,2			
	NR_TDD_FR1_D			-94.65	-115.5
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				-115
					-114
λ/	NR_FDD_FR1_G		dBm/CSI-RS		
$N_{oc}$	NR_FDD_FR1_H		SCS		-113.5
Note2	NR_FDD_FR1_A,				-114
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				-113.5
	NR_TDD_FR1_C				-114
	NR_FDD_FR1_D,	3		-91.65	-112.5
	NR_TDD_FR1_D	3		-91.00	-112.0
	NR_FDD_FR1_E,				-112
	NR_TDD_FR1_E				-112
	NR FDD FR1 G				-111
	NR FDD FR1 H				-110.5
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		1~3	dB	10	-3
L <sub>s</sub> / L <sub>ot</sub>	ND EDD ED4 A	1~3	QD.	10	-3
	NR_FDD_FR1_A,		dBm/CSI-RS SCS		-120
	NR_TDD_FR1_A			Ì	
	NR_FDD_FR1_B				-119.5
	NR_TDD_FR1_C	1,2			-119
	NR_FDD_FR1_D,			-84.65	-118.5
	NR_TDD_FR1_D				-110.5
	NR_FDD_FR1_E,				-118
	NR_TDD_FR1_E				-110
001.00	NR_FDD_FR1_G				-117
CSI-RS	NR_FDD_FR1_H				-116.5
RSRP Note3	NR_FDD_FR1_A,				
Notes	NR_TDD_FR1_A				-117
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C				-116
	NR FDD FR1 D,				-110
	NR_TDD_FR1_D	3		-81.65	-115.5
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				-87.28
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				-86.78
	NR_TDD_FR1_C		dBm/9.36		-86.28
	NR_FDD_FR1_D,	1,2	MHz	-56.28	-85.78
	NR_TDD_FR1_D	1,4	1711 12	-00.20	00.70
lo Note3	NR_FDD_FR1_E,				-85.28
10	NR_TDD_FR1_E				-05.20
	NR_FDD_FR1_G				-84.28
	NR_FDD_FR1_H				-83.78
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A	_	dBm/38.16		-81.19
	NR FDD FR1 B	3	MHz	-50.19	-80.69
	NR_TDD_FR1_C				-80.19
1			1	1	

NR_FDD_FR1_D, NR_TDD_FR1_D				-79.69
NR_FDD_FR1_E, NR_TDD_FR1_E				-79.19
NR_FDD_FR1_G				-78.19
NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_{oc}$	1~3	dB	10	-3
Propagation condition	1~3		AWGN	AWGN

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.6.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.19.2.

### A.6.7.5 E-UTRAN RSRP

#### A.6.7.5.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.2 for SA inter-RAT E-UTRAN RSRP measurements.

#### A.6.7.5.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.5.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRP are tested by using the parameters in A.6.7.5.1.2-2 and A.6.7.5.1.2-3.

Table A.6.7.5.1.2-1: Inter-RAT E-UTRAN RSRP supported test configurations with FR1 serving cell

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD
6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN TDD
Note: The UE is	only required to be tested in one of the supported test configurations

Table A.6.7.5.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters

Parameter		Unit	Cell 1	
NR RF channel number			1	
Duplex mode	Config 1, 4		FDD	
Duplex mode	Config 2, 3, 5, 6		TDD	
	Config 1, 4		N/A	
TDD Configuration	Config 2, 5		TDDConf.1.1	
_	Config 3, 6		TDDConf.1.2	
	Config 1, 4		10: N <sub>RB,c</sub> = 52 (FDD)	
BW <sub>channel</sub>	Config 2, 5	MHz	10: N <sub>RB,c</sub> = 52 (TDD)	
	Config 3, 6		40: N <sub>RB,c</sub> = 106 (TDD)	
Gap pattern Id			0	
DDCCII reference messurement	Config 1, 4		SR.1.1 FDD	
PDSCH reference measurement channel	Config 2, 5		SR.1.1 TDD	
Channel	Config 3, 6		SR.2.1 TDD	
	Config 1, 4		CR.1.1 FDD	
CORSET reference channel	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
	Initial DL BWP		DLBWP.0.1	
DIMD and investigate	Dedicated DL BWP		DLBWP.1.1	
BWP configurations	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1	
OCNG pattern <sup>Note1</sup>			OP.1	
SMTC configuration			SMTC.1	
CCD configuration	Config 1, 2, 4, 5		SSB.1 FR1	
SSB configuration	Config 3, 6		SSB.2 FR1	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH_DMRS to SSS	3			
EPRE ratio of PBCH to PBCH_DMF	RS			
EPRE ratio of PDCCH_DMRS to SS	SS			
EPRE ratio of PDCCH to PDCCH_0	DMRS	dB	0	
EPRE ratio of PDSCH_DMRS to SS	SS			
EPRE ratio of PDSCH to PDSCH_D	MRS			
EPRE ratio of OCNG DMRS to SSS				
EPRE ratio of OCNG to OCNG DMI	RS			
N <sub>oc</sub> Note2		dBm/15 KHz	-104	
N <sub>oc</sub> Note2	Config 1, 2, 4, 5	dPm/CCC	-104	
Noc. 3302	Config 3, 6	dBm/SCS	-101	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	
Ê <sub>s</sub> /I <sub>ot</sub> Note3		dB	17	
SS-RSRP <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/SCS	-87	
33-K3KP	Config 3, 6	ubili/SUS	-84	
SSB_RP <sup>Note3</sup>	Config 1, 2, 4, 5	dDm/CCC	-87	
33D_KP.1900	Config 3, 6	dBm/SCS	-84	
Io <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96	
10	Config 3, 6	dBm/38.16 MHz	-52.87	
Propagation condition			AWGN	
Antenna Configuration and Correlat	ion Matrix		1x2	
11 / / 0010 1 111				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\infty}$  to be fulfilled.

Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.7.5.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters

Test 1	Parameter		Unit	Cell 2		
Duplex mode						
Config 4, 5, 6	E-UTRA RF channel numb	oer		1		
TDD special subframe   Config 1, 2, 3   Config 4, 5, 6	Duplex mode	Config 1, 2, 3				
configuration (Natural DD uplink-downlink condiguration)         Config 4, 5, 6         6           TDD uplink-downlink condiguration (Note)         Config 4, 5, 6         1           BW-manned         MHZ         5 MHz: Nasc = 25 to MHz: Nasc = 50 20 MHz: Nasc		Config 4, 5, 6		TE	)D	
TDD uplink-downlink   Config 1, 2, 3   N/A	TDD special subframe	Config 1, 2, 3		N <sub>i</sub>	′A	
Config 4, 5, 6   MHz   S MHz: Nas <sub>6</sub> = 25   10 MHz: Nas <sub>6</sub> = 50   20 MHz: Nas <sub>6</sub> = 50   20 MHz: Nas <sub>6</sub> = 100						
BWchannel	TDD uplink-downlink	Config 1, 2, 3		N/	/A	
10 MHz: Naso = 50   20 MHz: Naso = 50   20 MHz: Naso = 50   20 MHz: Naso = 100		Config 4, 5, 6				
PDSCH parameters:	BWchannel		MHz		•	
PDSCH parameters:					**	
DL Reference Measurement Channel   Nome				20 MHz: N	I <sub>RB,c</sub> = 100	
Config 1, 2, 3   S MHz: R:11 FDD		Note:		•	•	
Darameters:   10 MHz: R.6 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   10 MHz: R.6 FDD   10 MHz: R.6 FDD   20 MHz: R.10 FDD						
DL Reference   Config 4, 5, 6   S MHz: R.10 FDD		Config 1, 2, 3				
Measurement Channel \text{Notine2}						
Channe Note2		Cartin 4 5 C	<u> </u>			
Config 1, 2, 3   5 MHz: R.10 TDD		Config 4, 5, 6				
Config 1, 2, 3	Channel					
10 MHz: OP.6 FDD   20 MHz: OP.14 FDD   5 MHz: OP.10 TDD   10 MHz: OP.2 TDD   10 MHz: OP.8 TDD   10 MHz: OP	OCNC PottornoNote2	Config 1 2 2				
Config 4, 5, 6   Conf	OCING Patterns	Corning 1, 2, 3			-	
Config 4, 5, 6   5 MHz: OP.10 TDD   10 MHz: OP.2 TDD   20 MHz: OP.8 TDD						
PBCH_RA		Config 4 5 6				
BBCH_RA   PBCH_RB   PSS_RA   SSS_RA   PCFICH_RB   PHICH_RA   PDCCH_RB		301111g -1, 0, 0				
PBCH_RA						
PBCH_RB	PBCH_RA					
SSS_RA						
SSS_RA	PSS_RA					
PHICH_RA						
PHICH_RB	PCFICH_RB					
PDCCH_RA	PHICH_RA					
PDCCH_RB			dB	(	)	
PDSCH_RA						
PDSCH_RB						
OCNG_RANote3         Bands FDD_A Note 9, TDD_A         -117           NocNote4         Bands FDD_B1, FDD_B Note 10 Bands FDD_C, TDD_C Bands FDD_D Bands FDD_E, FDD_F Note 7, TDD_E Bands FDD_G Note 8 Bands FDD_H         -91.65         -116.5           Es/Noc Bands FDD_G Note 8 Bands FDD_H         Bands FDD_G Note 9, TDD_A Bands FDD_A Note 9, TDD_A Bands FDD_B1, FDD_B Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C         dB         10         -4           RSRPNote5         Bands FDD_B1, FDD_B ABands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C         dBm/15kHz         -81.65         -120.5						
DCNG_RBNote3						
Bands FDD_A Note 9, TDD_A						
Noc Note4   Bands FDD_B1, FDD_B2 Note 10   -116.5     -116.5     -116.5       -116.5         -116.5	OCNG_RB <sup>Note3</sup>	T				
Noc Note4		TDD_A			-117	
Bands FDD_D   Bands FDD_E, FDD_F   Note 7, TDD_E   Bands FDD_G Note 8   Bands FDD_H		FDD_B2 Note 10			-116.5	
Bands FDD_B   FDD_F   Note 7, TDD_E   Bands FDD_G Note 8	Noc Note4		dBm/15kHz	-91 65		
Note 7, TDD_E   Bands FDD_G Note 8   -114     -113.5	1 100		GDITT, TORTIZ	01.00	-115.5	
Bands FDD_H         -113.5           Ê₅/N₀c         dB         10         -4           Ê₅/I₀t Note5         dB         10         -4           Bands FDD_A Note 9, TDD_A         TDD_A         -121           RSRPNote5         Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C         -81.65         -120.5		Note 7, TDD_E			-115	
È <sub>s</sub> /N <sub>oc</sub> dB         10         -4           È <sub>s</sub> /I <sub>ot</sub> <sup>Note5</sup> dB         10         -4           Bands FDD_A Note 9, TDD_A         -121         -121           RSRPNote5         Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C         -81.65         -120.5           Bands FDD_C, TDD_C         -120         -120						
Es/Iot Note5         dB         10         -4           Bands FDD_A Note 9, TDD_A         -121         -121           RSRPNote5         Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C         -81.65         -120.5	Ês/Noc	Danao i DD_II	dB	10		
RSRPNote5  Bands FDD_A Note 9, TDD_A  Bands FDD_B1, FDD_B2 Note 10  Bands FDD_C, TDD_C  Bands FDD_C, TDD_C  Bands FDD_C, TDD_C	Ês/Iot <sup>Note5</sup>					
RSRP <sup>Note5</sup> Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C  -120.5  -120.5	— v. 101		45			
Bands FDD_C, TDD_C -120	RSRP <sup>Note5</sup>	Bands FDD_B1,	dBm/15kHz	-81.65	-120.5	
					-120	

	T	ı		
	Bands FDD_E, FDD_F Note 7, TDD_E			-119
	Bands FDD_G Note 8			-118
	Bands FDD_H			-117.5
	Bands FDD_A Note 9,			-121
	TDD_A			-121
	Bands FDD_B1,			-120.5
	FDD_B2 Note 10			
SCH_RPNote5	Bands FDD_C, TDD_C	dBm/15kHz	-81.65	-120
0011_1(1	Bands FDD_D	abili, loki iz	01.00	-119.5
	Bands FDD_E, FDD_F			-119
	Note 7, TDD_E			
	Bands FDD_G Note 8			-118
	Bands FDD_H			-117.5
	Bands FDD_A Note 9,			-87.76 +
	TDD_A			10log(N <sub>RB,c</sub> /50)
	Bands FDD_B1,			-87.26 +
	FDD_B2 Note 10			10log(N <sub>RB,c</sub> /50)
	Bands FDD C, TDD C			-86.76 +
				10log(N <sub>RB,c</sub> /50)
Io <sup>Note5</sup>	Bands FDD D	dBm/Ch BW	-53.45 +	-86.26 +
			10log(N <sub>RB,c</sub> /50)	10log(N <sub>RB,c</sub> /50)
	Bands FDD_E, FDD_F			-85.76 +
	Note 7, TDD_E			10log(N <sub>RB,c</sub> /50)
	Bands FDD_G Note 8			-84.76 +
				10log(N <sub>RB,c</sub> /50) -84.26 +
	Bands FDD_H			10log(N <sub>RB,c</sub> /50)
Propagation Condition	1		AW	
Antenna Configuration and	Correlation Matrix			(2
	a contention watra	. ,.	17 Totalia della 404 in Ti	

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].
- Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
- Note 8: Except Band 29.
- Note 9: Except Band 32, Band 75 and Band 76.
- Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

#### A.6.7.5.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRP measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.2.

#### A.6.7.6 E-UTRAN RSRQ

#### A.6.7.6.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.3 for SA inter-RAT E-UTRAN RSRQ measurements.

#### A.6.7.6.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.6.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRQ are tested by using the parameters in A.6.7.6.1.2-2 and A.6.7.6.1.2-3.

Table A.6.7.6.1.2-1: Inter-RAT E-UTRAN RSRQ supported test configurations with FR1 serving cell

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD
6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN TDD
Note: The UE i	s only required to be tested in one of the supported test configurations

Table A.6.7.6.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

Parameter	Unit	(	Cell 1		
NR RF channel number	J		1		
Config 1 4				FDD	
Duplex mode	Config 2, 3, 5, 6		TDD		
	Config 1, 4		N/A		
TDD Configuration	Config 2, 5	1	TDDConf.1.1		
	Config 3, 6	-	TDDConf.1.2		
	Config 1, 4		10: N <sub>RB,c</sub> = 52 (FDD)		
BWchannel	Config 2, 5	MHz	10: N <sub>RB,c</sub> = 52 (TDD) 40: N <sub>RB,c</sub> = 106 (TDD)		
· · · · · · · · · · · · · · · · · ·	Config 3, 6	]			
Gap pattern Id	j		10111110,0	0	
	Config 1, 4		SR.	1.1 FDD	
PDSCH reference measurement	Config 2, 5			1.1 TDD	
channel	Config 3, 6			2.1 TDD	
	Config 1, 4			1.1 FDD	
CORSET reference channel	Config 2, 5	1		1.1 TDD	
CONCET TOTOTOTION CHAINION	Config 3, 6	1		2.1 TDD	
	Initial DL BWP			BWP.0.1	
	Dedicated DL BWP			BWP.1.1	
BWP configurations	Initial UL BWP			BWP.0.1	
	Dedicated UL BWP			BWP.1.1	
OCNG pattern <sup>Note1</sup>			OLBWF.1.1		
SMTC configuration		SMTC.1			
Config 1 2 4 5			SSB.1 FR1		
SSB configuration	Config 3, 6	-		B.2 FR1	
EPRE ratio of PSS to SSS			00B.21 K1		
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMR		=	0		
EPRE ratio of PDCCH_DMRS to SS		dB			
EPRE ratio of PDCCH to PDCCH_D					
EPRE ratio of PDSCH_DMRS to SS					
EPRE ratio of PDSCH to PDSCH_D		=			
EPRE ratio of OCNG DMRS to SSS	IVINO	1			
EPRE ratio of OCNG blinks to 333	00	=			
Noc Note2	ιο	dBm/15 KHz		-104	
	Config 1, 2, 4, 5	UDITI/13 KTIZ		-104 -104	
Noc <sup>Note2</sup>	Config 3, 6	dBm/SCS			
Ê /N	Coning 3, 6	٩D		-101 	
Ê <sub>s</sub> /N <sub>oc</sub> Ê <sub>s</sub> /I <sub>of</sub> <sup>Note3</sup>		dB dB	17 17	7	
	Config 1 2 4 F	ub	-87	-97	
SS-RSRQ <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/SCS	-87 -84	-97 -94	
	Config 3, 6				
SSB_RP <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/SCS	-87	-97	
	Config 3, 6	dD/0.00 MU.	-84	-94	
Io <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96	-68.26	
Decree well as a second	Config 3, 6	dBm/38.16 MHz	-52.87	-62.17	
Propagation condition		A	WGN		
Antenna Configuration and Correlation Matrix			1x2		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\infty}$  to be fulfilled.

Note 3:  $\hat{E}_s$ /I<sub>ot</sub>, SS-RSRQ, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.7.6.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

Paran	neter	Unit		Cell 2	
			Test 1	Test 2	Test 3
E-UTRA RF channel number				1	
Duplex mode	Config 1, 2, 3			FDD	
	Config 4, 5, 6			TDD	
TDD special subframe	Config 1, 2, 3			N/A	
configuration <sup>Note1</sup>	Config 4, 5, 6			6	
TDD uplink-downlink	Config 1, 2, 3			N/A	
configuration <sup>Note1</sup>	Config 4, 5, 6			1	
BW <sub>channel</sub>		MHz		$5 \text{ MHz: } N_{RB,c} = 25$	5
			10 MHz: N <sub>RB,c</sub> = 50		
			2	$0 \text{ MHz: } N_{RB,c} = 10$	00
PDSCH parameters:	Note?			-	
DL Reference Measureme				- NUL D 44 EDD	
PCFICH/PDCCH/PHICH	Config 1, 2, 3			5 MHz: R.11 FDC	
parameters:				10 MHz: R.6 FDC	
DL Reference Measurement	Config 4 F 6	1		0 MHz: R.10 FDI	
Channel <sup>Note2</sup>	Config 4, 5, 6			5 MHz: R.11 TDD 10 MHz: R.6 TDD	
Chamer				10 MHz: R.10 TDI	
OCNG Patterns <sup>Note2</sup>	Config 1, 2, 3			MHz: OP.19 FD	
OCIVOT atterns	Coming 1, 2, 3			0 MHz: OP.6 FD	
				) MHz: OP.14 FD	
	Config 4, 5, 6	†		MHz: OP.10 TD	
				0 MHz: OP.2 TD	
				0 MHz: OP.8 TD	
PBCH_RA	•				
PBCH_RB		1			
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB		dB	0		
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RANote3		<u> </u>			
OCNG_RB <sup>Note3</sup>	D I EDD A Note 0				
	Bands FDD_A Note 9, TDD_A				-119.5
	Bands FDD_B1,				-119
	FDD_B2 Note 10				
N <sub>oc</sub> Note4	Bands FDD_C, TDD_C	dBm/15kHz	-83	-104.70	-118.5 -118
	Bands FDD_D				-118
	Bands FDD_E, FDD_F  Note 7, TDD_E				-117.5
	Bands FDD_G Note 8	]			-116.5
	Bands FDD_H				-116
Ê <sub>s</sub> /N <sub>oc</sub>		dB	-1.75	-4.0	-4.0
Ê <sub>s</sub> /I <sub>ot</sub> Note5		dB	-1.75	-4.0	-4.0
	Bands FDD_A Note 9, TDD_A				-123.5
RSRP <sup>Note5</sup>	Bands FDD_B1, FDD_B2 Note 10	dBm/15kHz	-84.75	-108.70	-123
	Bands FDD_C, TDD_C	<del> </del>			-122.5
	Bands FDD_D	1			-122

	D . EDD E EDT -		ı		
	Bands FDD_E, FDD_F Note 7, TDD_E				-121.5
	Bands FDD_G Note 8				-120.5
	Bands FDD_H	,			-120
	Bands FDD_A Note 9, TDD_A Bands FDD_B1,				
	FDD_B2 Note 10				
RSRQ <sup>Note5</sup>	Bands FDD_C, TDD_C	dB	-14.76	-16.25	-16.25
	Bands FDD_D Bands FDD_E, FDD_F Note 7, TDD_E				
	Bands FDD_G Note 8		ļ		
	Bands FDD_H				
	Bands FDD_A Note 9, TDD_A				-90.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_B1, FDD_B2 Note 10	dBm/Ch BW	-53 + 10log(N <sub>RB,c</sub> /50)	-75.46 + 10log(N <sub>RB,c</sub> /50)	-89.76 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_C, TDD_C				-89.26 + 10log(N <sub>RB,c</sub> /50)
Io <sup>Note5</sup>	Bands FDD_D				-88.76 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_E, FDD_F Note 7, TDD_E				-88.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_G Note 8				-87.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_H				-86.76 + 10log(N <sub>RB,c</sub> /50)
Propagation Condition			AWGN		
Antenna Configuration and Correlation Matrix				1x2	

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.
- Note 5: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].
- Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
- Note 8: Except Band 29.
- Note 9: Except Band 32, Band 75 and Band 76.
- Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

#### A.6.7.6.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRQ measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.3.

#### A.6.7.7 E-UTRAN RS-SINR

#### A.6.7.7.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.4 for SA inter-RAT E-UTRAN RS-SINR measurements.

#### A.6.7.7.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.7.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RS-SINR are tested by using the parameters in A.6.7.7.1.2-2 and A.6.7.7.1.2-3.

Table A.6.7.7.1.2-1: Inter-RAT E-UTRAN RS-SINR supported test configurations with FR1 serving cell

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD
6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN TDD
Note: The UE is	s only required to be tested in one of the supported test configurations

Table A.6.7.7.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters

Parameter		Unit	Cell 1	
NR RF channel number			1	
Duplex mode Config 1, 4			FDD	
Daplex mode	Config 2, 3, 5, 6		TDD	
	Config 1, 4		N/A	
TDD Configuration	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
	Config 1, 4		10: N <sub>RB,c</sub> = 52 (FDD)	
BWchannel	Config 2, 5	MHz	10: N <sub>RB,c</sub> = 52 (TDD)	
	Config 3, 6		40: N <sub>RB,c</sub> = 106 (TDD)	
Gap pattern Id			0	
PDSCH reference measurement	Config 1, 4		SR.1.1 FDD	
channel	Config 2, 5		SR.1.1 TDD	
Chamer	Config 3, 6		SR.2.1 TDD	
	Config 1, 4		CR.1.1 FDD	
CORSET reference channel	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
	Initial DL BWP		DLBWP.0.1	
BWP configurations	Dedicated DL BWP		DLBWP.1.1	
BVVF Cornigurations	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1	
OCNG pattern <sup>Note1</sup>			OP.1	
SMTC configuration			SMTC.1	
SSB configuration	Config 1, 2, 4, 5		SSB.1 FR1	
33B Configuration	Config 3, 6		SSB.2 FR1	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH_DMRS to SS				
EPRE ratio of PBCH to PBCH_DM				
EPRE ratio of PDCCH_DMRS to S				
EPRE ratio of PDCCH to PDCCH_		dB	0	
EPRE ratio of PDSCH_DMRS to S				
EPRE ratio of PDSCH to PDSCH_I				
EPRE ratio of OCNG DMRS to SS				
EPRE ratio of OCNG to OCNG DM	RS			
N <sub>oc</sub> Note2		dBm/15 KHz	-104	
N <sub>oc</sub> Note2	Config 1, 2, 4, 5	dBm/SCS	-104	
	Config 3, 6	ubili/SCS	-101	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	
Ê <sub>s</sub> /I <sub>ot</sub> Note3		dB	17	
SS-RS-SINR <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/SCS	-87	
OO-IXO-OIIVIX	Config 3, 6	ubiii/303	-84	
SSB_RP <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/SCS	-87	
00D_KF	Config 3, 6		-84	
lo <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96	
	Config 3, 6	dBm/38.16 MHz	-52.87	
Propagation condition			AWGN	
Antenna Configuration and Correla	tion Matrix		1x2	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\infty}$  to be fulfilled.

Note 3:  $\hat{E}_s/I_{ot}$ , SS-RS-SINR, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.7.7.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters

Parameter		Unit	Cell 2		
			Test 1	Test 2	Test 3
E-UTRA RF channel number				1	
Duplex mode	Config 1, 2, 3	<u> </u>		FDD	
	Config 4, 5, 6			TDD	
TDD special subframe	Config 1, 2, 3			N/A	
configuration <sup>Note1</sup>	Config 4, 5, 6			6	
TDD uplink-downlink	Config 1, 2, 3			N/A	
configuration <sup>Note1</sup>	Config 4, 5, 6	<del>-</del>		1	
BW <sub>channel</sub>		MHz	5 MHz: N <sub>RB,c</sub> = 25		
			10 MHz: $N_{RB,c} = 50$		
			20 MHz: N <sub>RB,c</sub> = 100		
PDSCH parameters:				-	
DL Reference Measureme					
PCFICH/PDCCH/PHICH	Config 1, 2, 3			5 MHz: R.11 FDD	)
parameters:				10 MHz: R.6 FDD	)
DL Reference			2	20 MHz: R.10 FD	D
Measurement	Config 4, 5, 6			5 MHz: R.11 TDE	)
Channel <sup>Note2</sup>				10 MHz: R.6 TDD	
			2	20 MHz: R.10 TD	D
OCNG Patterns <sup>Note2</sup>	Config 1, 2, 3			MHz: OP.19 FD	
				0 MHz: OP.6 FD	
				0 MHz: OP.14 FD	
	Config 4, 5, 6			MHz: OP.10 TD	
				0 MHz: OP.2 TD	
			2	0 MHz: OP.8 TD	D
PBCH_RA		<u> </u>			
PBCH_RB		<u> </u>			
PSS_RA		<u> </u>			
SSS_RA		<u> </u>			
	PCFICH_RB				
PHICH_RA					
PHICH_RB		dB		0	
PDCCH_RA		<u> </u>			
PDCCH_RB		<u> </u>			
PDSCH_RA		<u> </u>			
PDSCH_RB		1			
OCNG_RANote3		1			
OCNG_RB <sup>Note3</sup>	Decade CDD A Note 9				I
	Bands FDD_A Note 9,				-119.5
	TDD_A Bands FDD_B1,	+			
	FDD_B2 Note 10				-119
		+			-118.5
N <sub>oc1</sub> Note4	Bands FDD_C, TDD_C Bands FDD_D	dBm/15kHz	-88	-108.50	-118
	Bands FDD_E, FDD_F	1			-110
	Note 7, TDD_E				-117.5
	Bands FDD_G Note 8	†			-116.5
	Bands FDD_G	†			-116
	Bands FDD_A Note 9,				
	TDD_A				-113.5
	Bands FDD B1,	†			
	FDD_B2 Note 10		_		-113
N <sub>oc2</sub> Note4a	Bands FDD_C, TDD_C	dBm/15kHz	-82	-114.5	-112.5
	Bands FDD_D	†			-112.5
	Bands FDD_E, FDD_F	†			
	Note 7, TDD_E				-111.5
	, , , , , , , , , , , , , , , , , , , ,			ļ	!

	Bands FDD_G Note 8				-110.5
	Bands FDD_H				-110
CRS Ê <sub>s</sub> /N <sub>oc1</sub>		dB	-1.75	-4.0	-4.0
CRS Ê <sub>s</sub> /I <sub>ot</sub> Note5	CRS Ê <sub>s</sub> /I <sub>ot</sub> Note5		-1.75	-4.0	-4.0
	Bands FDD_A Note 9, TDD_A				-123.5
	Bands FDD_B1, FDD_B2 Note 10				-123
RSRP <sup>Note5</sup>	Bands FDD_C, TDD_C	dBm/15kHz	-89.75	-88.50	-122.5
	Bands FDD_D	4511, 1011 12	000	00.00	-122
	Bands FDD_E, FDD_F Note 7, TDD_E				-121.5
	Bands FDD_G Note 8				-120.5
	Bands FDD_H				-120
	Bands FDD_A Note 9, TDD_A				
	Bands FDD_B1, FDD_B2 Note 10				
RS-SINR <sup>Note5</sup>	Bands FDD_C, TDD_C	dB	-1.75	20	-4.0
K3-SINK	Bands FDD_D	иь	-1.75	20	-4.0
	Bands FDD_E, FDD_F Note 7, TDD_E				
	Bands FDD_G Note 8				
	Bands FDD_H				
	Bands FDD_A Note 9, TDD_A				-93.48 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_B1, FDD_B2 Note 10				-92.98 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_C, TDD_C				-92.48 + 10log(N <sub>RB,c</sub> /50)
Io <sup>Note5</sup>	Bands FDD_D	dBm/Ch BW	-53.79 + 10log(N <sub>RB,c</sub> /50)	-60.56 + 10log(N <sub>RB,c</sub> /50)	-91.98 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_E, FDD_F Note 7, TDD_E				-91.48 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_G Note 8				-90.48 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_H				-89.98 + 10log(N <sub>RB,c</sub> /50)
Propagation Condition			AWGN		<u> </u>
Antenna Configuration and Correlation Matrix				1x2	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over CRS subcarriers and time and shall be modelled as AWGN of appropriate power for Noc1 to be fulfilled.

Note 4a: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers other than CRS subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>0c2</sub> to be fulfilled.

Note 5: CRS  $\hat{E}_s/I_{ot}$ , RSRP, RS-SINR and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: E-UTRA operating band groups are as defined in clasue 3.5 of TS 36.133 [15].

Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.

Note 8: Except Band 29.

Note 9: Except Band 32, Band 75 and Band 76.

Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel

bandwidth within 1475.9-1510.9 MHz.

#### A.6.7.7.1.3 Test Requirements

The SA inter-RAT E-UTRAN RS-SINR measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.4.

# A.7 NR standalone tests with one or more NR cells in FR2

### A.7.1 SA: RRC\_IDLE state mobility

#### A.7.1.1 Cell re-selection to NR

#### A.7.1.1.1 Cell reselection to FR2 intra-frequency NR case

#### A.7.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

#### A.7.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.1.1.1.2-1, A.7.1.1.1.2-2 and A.7.1.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table A.7.1.1.2-1: Supported test configurations

Co	nfiguration	Description
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	quired to be tested in one of the supported test configurations.

Table A.7.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case

	Parameter		Test configuration	Value	Comment
Initial	Active cell		1, 2	Cell1	
condition	Neighbour cells		1, 2	Cell2	
T2 end	Active cell		1, 2	Cell2	
condition	Neighbour cells		1, 2	Cell1	
Final condition	Visited cell		1, 2	Cell1	
RF Channe	el Number		1, 2	1	
Time offse	t between cells		1, 2	3 µs	Synchronous cells
Access Ba	rring Information	-	1, 2	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR2	
			2	SSB.2 FR2	
SMTC con	figuration		1, 2	SMTC pattern 1	
DRX cycle	length	s	1, 2	1.28	The value shall be used for all cells in the test.
PRACH co	onfiguration index		1, 2	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBe	estCell		1, 2	Not configured	
T1		S	1, 2	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2	135	T2 needs to be defined so that cell re- selection reaction time is taken into account.
Т3		S	1, 2	35	T3 needs to be defined so that cell re- selection reaction time is taken into account.

Table A.7.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test	Cell 1				Cell 2		
		configuration	T1	T2	T3	T1	T2	T3	
TDD configuration		1, 2	Т	DDConf.3.		TDDConf.3.1			
PDSCH RMC		1	S	R.3.1 TDD	1		N/A		
configuration		2	S	R.3.1 TDD	1				
RMSI CORESET		1	C	R.3.1 TDD		C	R.3.1 TDI	)	
RMC configuration		2	C	R.3.1 TDD		C	R.3.1 TDE	)	
Dedicated CORESET		1	C	CR.3.1 TDI	)	C	CR.3.1 TD	D	
RMC configuration		2		CR.3.1 TDI			CR.3.1 TD		
OCNG Pattern		1, 2	OP.1 d	lefined in A	3.2.1	OP.1 c	lefined in A	A.3.2.1	
Initial DL BWP		1, 2		DLBWP.0.1			DLBWP.0.1		
configuration		·							
Initial UL BWP		1, 2	l	JLBWP.0.1		Į	JLBWP.0.1		
configuration									
RLM-RS		1, 2		SSB			SSB		
Qrxlevmin	dBm/SCS	1		-140			-140		
		2		-137			-137		
Pcompensation	dB	1, 2		0		0			
Qhysts	dB	1, 2		0		0			
Qoffsets, n	dB	1, 2		0		0			
Cell_selection_and_		1, 2							
reselection_quality_				SS-RSRP		SS-RSRP			
measurement									
AoA setup		1, 2	Setup 1	defined in A	A.3.15.1	Setup 1	defined in	A.3.15.1	
• /	- 15			0.00	0.00		2.22		
$\hat{E}_{s}/I_{ot}$	dB	1	17	-3.09	2.83	-infinity	2.83	-3.09	
	·- /aaa	2							
$N_{oc}$ Note2	dBm/SCS	1			-98				
		2			-95				
$N_{\!oc}$ Note2	dBm/15 kHz	1			-107	7			
		2							
$\hat{E}_s/N_{oc}$	dB	1	17	14	17	-infinity	17	14	
		2							
SS-RSRP Note3	dBm/SCS	1	-81 -84 -81 -infinity		-81	-84			
		2			-infinity	-78	-81		
lo	dBm/95.04 MHz	1				-50.19			
		2				-50.19			
Treselection	S	1, 2	0 0 0 0 0		0				
SintrasearchP	dB	1, 2	50 50						
Propagation		1, 2			AWG	iN			
Condition									

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $\frac{N_{oc}}{N_{oc}}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.7.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 130 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 27 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{detect, NR\_Intra} + T_{SI-NR}$ , and to an already detected cell can be expressed as:  $T_{evaluate, NR\_intra} + T_{SI-NR}$ ,

#### Where:

$$\begin{split} T_{\text{detect, NR\_Intra}} & \text{See Table 4.2.2.3-1 in clause 4.2.2.3} \\ T_{\text{evaluate, NR\_intra}} & \text{See Table 4.2.2.3-1 in clause 4.2.2.3} \end{split}$$

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 129.28 s, allow 130 s for the cell re-selection delay to a newly detectable cell and 26.88 s for the cell re-selection delay to an already detected cell in the test case, which we allow 27 s.

## A.7.1.1.2 Cell reselection to FR2 inter-frequency NR case

## A.7.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

#### A.7.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.7.1.1.2.2-1, A.7.1.1.2.2-2 and A.7.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table A.7.1.1.2.2-1: Supported test configurations

Configuration	Description for serving cell	Description for target cell				
1	120 kHz SSB SCS, 100 MHz bandwidth,	120 kHz SSB SCS, 100 MHz bandwidth, TDD				
	TDD duplex mode	duplex mode				
2	240 kHz SSB SCS, 100 MHz bandwidth,	240 kHz SSB SCS, 100 MHz bandwidth, TDD				
	TDD duplex mode duplex mode					
Note: The UE is o	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.7.1.1.2.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
T1 end	Active cell		1, 2	Cell1	The UE shall perform reselection to cell 1
condition	Neighbour cells		1, 2	Cell2	during T1
T3 end condition	Active cell		1, 2	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
RF Channe	el Number		1, 2	1, 2	
Time offset	t between cells		1, 2	3 µs	Synchronous cells
Access Ba	rring Information	-	1, 2	Not Sent	No additional delays in random access procedure.
SSB config	uration		1	SSB.1 FR2	
			2	SSB.2 FR2	
SMTC conf	figuration		1, 2	SMTC pattern 1	
DRX cycle	DRX cycle length		1, 2	1.28	The value shall be used for all cells in the test.
PRACH co	nfiguration index		1, 2	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBe	stCell		1, 2	Not configured	
T1		S	1, 2	35	T1 needs to be defined so that cell re- selection reaction time is taken into account.
T2		S	1, 2	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
Т3		S	1, 2	95	T3 needs to be defined so that cell reselection reaction time is taken into account.

Table A.7.1.1.2.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test	Cell 1		Cell 2				
		configuration	T1	T2	Т3	T1	T1 T2 T3		
TDD configuration		1, 2	Т	DDConf.3.1		TDDConf.3.1			
PDSCH RMC		1, 2	5	R.3.1 TDD	1		N/A		
configuration		,							
RMSI CORESET		1, 2	C	R.3.1 TDD		(	CR.3.1 TDI	)	
parameters									
RMSI CORESET		1, 2	С	CR.3.1 TDI	)	С	CR.3.1 TD	D	
RMC configuration									
OCNG Pattern		1, 2 1, 2		defined in A	.3.2.1		defined in A		
Initial DL BWP		1, 2		DLBWP.0.1		[	DLBWP.0.	1	
configuration									
Initial UL BWP		1, 2	Ų	JLBWP.0.1		Į	JLBWP.0.	1	
configuration									
RLM-RS		1, 2		SSB			SSB		
Qrxlevmin	dBm/SCS	1		-140			-140		
		2		-137			-137		
Pcompensation	dB	1, 2		0		0			
Qhysts	dB	1, 2		0		0			
Qoffsets, n	dB	1, 2		0		0			
Cell_selection_and_		1, 2							
reselection_quality_				SS-RSRP		SS-RSRP			
measurement									
AoA setup		1, 2	Sotup 1	defined in A	\ 2 15 1	Sotup 1	dofinad in	A 2 15 1	
			Setup 1	denned in F	1.3.13.1	Setup 1 defined in A.3.15.		A.S. 15. 1	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1	15	15	15	-3	-infinity	13	
L <sub>s</sub> /I <sub>ot</sub>		2							
$N_{oc}$ Note2	dBm/SCS	1			-98				
1 Voc		2			-95				
$N_{oc}$ Note2	dBm/15 kHz	1			-107	7			
1 Voc		2							
$\hat{E}_s/N_{oc}$	dB	1	15	15	15	-3	-infinity	13	
$E_s/I_{oc}$		2							
SS-RSRP Note3	dBm/SCS	1	-83	-83	-83	-101	-infinity	-85	
		2	-80	-80	-80	-98	-infinity	-82	
lo	dBm/95.04 MHz	1	-53.88	-53.88	-53.88	-67.25	-infinity	-55.80	
		2	-53.88 -53.88 -53.88		-67.25	-infinity	-55.80		
Treselection	S	1, 2	0 0 0		0	0	0		
SnonintrasearchP	dB	1, 2	50 Not sent						
Thresh <sub>x, high</sub>	dB	1, 2	48 48						
Thresh <sub>serving, low</sub>	dB	1, 2	44 44						
Thresh <sub>x, low</sub>	dB	1, 2	50 50						
Propagation		1, 2			AWG	N			
Condition									

OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density Note 1:

is achieved for all OFDM symbols.

Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers Note 2:

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled. SS-RSRP levels have been derived from other parameters for information purposes. They are not settable

Note 3: parameters themselves.

#### A.7.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 87 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 27 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter} + T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR\_inter} + T_{SI-NR}$ ,

#### Where:

Thigher\_priority\_search See clause 4.2.2.7

 $T_{evaluate, NR\_inter}$  See Table 4.2.2.4-1 in clause 4.2.2.4

 $T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 86.88 s, allow 87 s for the cell re-selection delay to a higher priority cell and 26.88 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 27 s.

# A.7.2 SA: RRC\_INACTIVE state mobility

# A.7.3 RRC\_CONNECTED state mobility

## A.7.3.1 Handover

## A.7.3.1.1 Inter-frequency handover from FR1 to FR2; unknown target cell

### A.7.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR2 inter frequency handover requirements specified in clause 6.1.1.5.

#### A.7.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.1.2-2, and A.7.3.1.1.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.1.2-1: Inter-frequency handover from FR1 to FR2 test configurations

C	Config	Description			
1		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
		Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2		Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
		Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
3		Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
		Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note:					

Table A.7.3.1.1.2-2: General test parameters Inter-frequency handover from FR1 to FR2

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Offset		dBm	[-120]	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2		S	≤10	

Table A.7.3.1.1.2-3: Cell specific test parameters for NR FR1-FR2 Inter frequency handover test case

Parameter	Unit	Ce	II 1	Cell 2		
Parameter		T1	T2	T1	T2	
NR RF Channel Number		1		2		

	Config 1		FDD	TDD
Duplex mode	Config 2,3		TDD	TDD
	Config 1		Not Applicable	TDDConf.3.1
TDD configuration	Config 2		TDDConf.1.1	TDDConf.3.1
	Config 3		TDDConf.2.1	TDDConf.3.1
	Config 1		10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
	Config 3	7	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
	Config 1		10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
	Config 3		40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
DRx Cycle	•	ms	Not Ap	plicable
	Config 1		SR.1.1 FDD	SR3.1 TDD
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	SR3.1 TDD
	Config 3		SR2.1 TDD	SR3.1 TDD
	Config 1		CR.1.1 FDD	CR3.1 TDD
CORESET Reference Channel	Config 2		CR.1.1 TDD	CR3.1 TDD
	Config 3		CR2.1 TDD	CR3.1 TDD
OCNG Patterns			OCNG p	pattern 1
CMTC configuration	Config 1,2		SMTC.1 FR1	SMTC.1 FR2
SMTC configuration	Config 3		SMTC.2 FR1	SMTC.1 FR2
PDSCH/PDCCH	Config 1,2	kHz	15 kHz	120 kHz
subcarrier spacing	Config 3	KIIZ	30 kHz	120 kHz
PUCCH/PUSCH	Config 1,2	Id I=	15 kHz	120 kHz
subcarrier spacing	Config 3	kHz	30 kHz	120 kHz
PRACH configuration			FR1 PRACH configuration	FR2 PRACH configuration
TRS configuration	Config 1		1 N/A	TRS.2.1 TDD
<b>3</b>	Config 2		N/A	TRS.2.1 TDD
TOI configuration	Config 3		N/A	TRS.2.1 TDD
TCI configuration	Initial DL DWD		N/A	CSI-RS.Config.0
BWP configuration	Initial DL BWP		DLBWP.0.1	DLBWP.0.1
	Dedicated DL BWP		DLBWP.1.1	DLBWP.1.1
	Initial UL BWP		ULBWP.0.1	ULBWP.0.1
Dedicated UL BWP			ULBWP.1.1	ULBWP.1.1
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH		dB	0	0

	o of OCNG DMRS to SSS(Note 1) o of OCNG to OCNG DMRS (Note					
$N_{oc}$ Note2		dBm/15kH z	TBD		TBD	
λ/ Note2	N Note2 Config 1,2		TE	3D	TBD	
TV <sub>oc</sub>	N <sub>oc</sub> Note2 Config 1,2 Config 3		TBD		TBD	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	-Infinity	TBD
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		TBD	TBD	-Infinity	TBD
IoNote3	Config 1,2	dBm/ BW	TBD	TBD	TBD	TBD
10.1888	Config 3	dBm/ BW	TBD	TBD	TBD	TBD
Propagation	on condition	-		AW	'GN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\rm ac}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

## A.7.3.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [722] ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [712]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.5.2.

This gives a total of [722] ms.

## A.7.3.1.2 Intra-frequency handover from FR2 to FR2; unknown target cell

## A.7.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 intra frequency handover requirements specified in clause 6.1.1.4.

### A.7.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.2.2-2, and A.7.3.1.2.2-3.

The test scenario comprises of carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.2.2-1: Intra-frequency handover from FR2 to FR2 test configurations

Config	Description
1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.1.2.2-2: General test parameters Intra-frequency handover from FR2 to FR2

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Offset		dBm	[-120]	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2		S	≤10	

Table A.7.3.1.2.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency handover test case

D		Unit	Cel	II 1	Cel	12	
Para	meter	Unit	T1	T2	onf.3.1  RB,c = 66  RB,c = 66  plicable  1 TDD  1 TDD  pattern 1  2.1 FR2  kHz  kHz  configuration 1  .1 TDD	T2	
NR RF Channel Numb	per		1				
Duplex mode			TDD				
TDD configuration				TDDC	onf.3.1		
BW <sub>channel</sub>		MHz					
BWP BW		MHz		100: N <sub>R</sub>	RB,c = 66		
DRx Cycle		ms					
PDSCH Reference me	easurement channel			SR3.1	I TDD		
CORESET Reference	Channel			CR3.1	1 TDD		
OCNG Patterns				OCNG p	oattern 1		
SMTC configuration				SMTC	.1 FR2		
PDSCH/PDCCH subc	kHz	120 kHz					
PUCCH/PUSCH subc	kHz	120 kHz					
PRACH configuration			FR2 PRACH configuration 1				
TRS configuration				TRS.2.	.1 TDD		
TCI configuration			CSI-RS.Config.0				
BWP configuration	Initial DL BWP						
	Dedicated DL BWP						
	Initial UL BWP						
	Dedicated UL BWP			ULBW	/P.1.1		
EPRE ratio of PSS to							
EPRE ratio of PBCH [							
EPRE ratio of PBCH t							
EPRE ratio of PDCCH							
EPRE ratio of PDCCH	dB	0	)	0			
EPRE ratio of PDSCH		42					
EPRE ratio of PDSCH							
	DMRS to SSS(Note 1)						
	to OCNG DMRS (Note						
1)							

$N_{oc}^{ m Note2}$		dBm/15kH z	TBD		TBD	
λ/ Note2	Config 1,2	dDm/CCC	TE	3D	TE	3D
TV <sub>oc</sub>	Config 3	dBm/SCS	TE	BD	TE	BD
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$		dB	TBD	TBD	TBD TBD	
Io <sup>Note3</sup>	Config 1,2	dBm/ BW	TBD	TBD	TBD	TBD
10	Config 3	dBm/ BW	TBD	TBD	TBD	TBD
Propagat	on condition	-		AW	GN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

## A.7.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [382] ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [372]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.4.2.

This gives a total of [382] ms.

## A.7.3.1.3 Inter-frequency handover from FR2 to FR2; unknown target cell

## A.7.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 inter frequency handover requirements specified in clause 6.1.1.4.

### A.7.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.3.2-2, and A.7.3.1.3.2-3.

The test scenario comprises of carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.3.2-1: Inter-frequency handover from FR2 to FR2 test configurations

Config	Description
1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.1.3.2-2: General test parameters Inter-frequency handover from FR2 to FR2

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Offset		dB	[-120]	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random access procedure.
Time offset betwe	en cells		3 μs	Synchronous cells
T1		S	5	
T2		S	≤10	

Table A.7.3.1.3.2-3: Cell specific test parameters for NR FR2-FR2 Inter frequency handover test case

Parameter		Unit	Се	II 1	Cell 2			
		Onit	T1	T2	T1	T2		
NR RF Channel Numb		1 2						
Duplex mode			TDD					
TDD configuration				TDDC				
BW <sub>channel</sub>		MHz		100: N <sub>R</sub>				
BWP BW		MHz		100: N <sub>R</sub>				
DRx Cycle		ms		Not App	'			
PDSCH Reference me				SR3.1				
CORESET Reference	Channel			CR3.1	I TDD			
OCNG Patterns				OCNG p	oattern 1			
SMTC configuration				SMTC				
PDSCH/PDCCH subca		kHz			kHz			
PUCCH/PUSCH subca	arrier spacing	kHz			kHz			
PRACH configuration				FR2 PRACH o				
TRS configuration				TRS.2.				
TCI configuration				CSI-RS.				
BWP configuration	BWP configuration Initial DL BWP			DLBWP.0.1				
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP			ULBWP.0.1				
5005 # (D00)	Dedicated UL BWP			ULBW	/P.1.1			
EPRE ratio of PSS to S								
EPRE ratio of PBCH D								
EPRE ratio of PBCH to								
EPRE ratio of PDCCH					0			
EPRE ratio of PDCCH		dB	(	)				
EPRE ratio of PDSCH EPRE ratio of PDSCH								
EPRE ratio of OCNG DEPRE ratio of OCNG to								
1)	OCING DIVIRS (Note							
,		dBm/15kH						
$N_{oc}^{$		Z	TE	3D	TE	3D		
Note2 Config 1,2		dBm/SCS	TE		TBD			
Corning 5		abili/000	TE	3D	TBD			
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD		
$\hat{E}_s/N_{oc}$		dB	TBD	TBD	TBD	TBD		
Io <sup>Note3</sup> Config 1,2		dBm/	TBD	TBD	TBD	TBD		

		BW						
	Config 3	dBm/ BW	TBD	TBD	TBD	TBD		
Propagat	ion condition	-		AW	'GN			
Note 1:	e 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
Note 2:	Interference from other cells and no	ise sources no	t specified in t	he test is assur	med to be cons	tant over		
	subcarriers and time and shall be m	odelled as AW	/GN of appropr	riate power for	$N_{\it oc}$ to be fulfil	led.		
Note 3:	: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.							
Note 4:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone							
Note 5:	As observed with 0 dBi gain antenna	a at the centre	of the quiet zo	ne				

### A.7.3.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [702] ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [692]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.4.2.

This gives a total of [702] ms.

## A.7.3.2 RRC Connection Mobility Control

## A.7.3.2.1 SA: RRC Re-establishment

## A.7.3.2.1.1 Intra-frequency RRC Re-establishment in FR2

## A.7.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.1.1-1, table A.7.3.2.1.1.1-2 and table A.7.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

Table A.7.3.2.1.1.1-1: Supported test configurations

Config		Description							
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode							
Note:	The UE is only re capability	equired to be tested in one of the supported test configurations depending on UE							

Table A.7.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2

	Parameter	Unit	Test configuration	Value	Comment
Initial Active cell			1	Cell1	
condition Neighbour cells 1 Cell2					
Final condition	Active cell		1	Cell2	
RF Channe	el Number		1	1	
Time offse	t between cells		1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311	N311		1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Ba	rring Information	-	1	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR2	
SMTC con	figuration		1	SMTC	
				pattern 1	
DRX cycle	length	S	1	OFF	
PRACH co	nfiguration index		1	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		S	1	5	
T2		ms	1	1600	Time for the UE to detect RLF
T3		S	1	3	

Table A.7.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter	Unit	Test		Cell 1		Cell 2			
		configuration	T1 T2 T3		T1	T2	T3		
TDD configuration		1	TDDConf.3.1 TDDConf.3.1				1		
PDSCH RMC		1	S	R.3.1 TDD	)		N/A		
configuration									
RMSI CORESET		1	C	R.3.1 TDD	)		CR.3.1 TDE	0	
RMC configuration									
Dedicated CORESET		1	C	CR.3.1 TDI	D	C	CR.3.1 TD	D	
RMC configuration									
TRS configuration		1		RS.2.1 TDI			N/A		
PDSCH/PDCCH TCI		1	7	ΓCI.State.2			N/A		
state									
OCNG Pattern		1	• • • • •	lefined in A		OP.1 defined in A.3.2.1			
Initial DL BWP		1		DLBWP.0.1		DLBWP.0.1			
configuration									
Initial UL BWP		1	ι	JLBWP.0.1		ULBWP.0.1			
configuration									
RLM-RS		1		SSB			SSB		
AoA setup		1	Setup 1	defined in A		Setup 1	defined in	A.3.15.1	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	-3.07	-infinity	-infinity	-5.07	2	2	
$N_{oc}$ Note2	dBm/15 kHz	1			-98				
$N_{oc}$ Note2	dBm/SCS	1			-89				
$\hat{E}_s/N_{oc}$	dB	1	4 -infinity -infinity			2	2	2	
SS-RSRP Note3	dBm/SCS	1	-85	-infinity	-infinity	-87	-87	-87	
lo	dBm/95.04 MHz	1	-52.94	-55.89	-55.89	-52.94	-55.89	-55.89	
Propagation		1			AWG	N		•	
Condition									

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.7.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell shall be less than [3] s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish\_delay}} = T_{UL\_grant} + T_{UE\_re\text{-establish\_delay}}.$$

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{freq} = 1$ 

 $T_{identify\_intra\_NR} = 1600 \text{ ms}$ 

 $T_{SI} = [1280]$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

T<sub>PRACH</sub> = [15] ms; it is the additional delay caused by the random access procedure.

This gives a total of [2945] ms, allow [3] s in the test case.

## A.7.3.2.1.2 Inter-frequency RRC Re-establishment in FR2

## A.7.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.2.1-1, table A.7.3.2.1.2.1-2 and table A.7.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

Table A.7.3.2.1.2.1-1: Supported test configurations

Config		Description
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations depending on UE

Table A.7.3.2.1.2.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR2

	Parameter	Unit	Test configuration	Value	Comment
Initial Active cell			1	Cell1	
condition	condition Neighbour cells 1 Cell2				
Final condition	Active cell		1	Cell2	
RF Channe	el Number		1	1, 2	
Time offse	t between cells		1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311	N311		1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Ba	rring Information	-	1	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR2	
			1	SMTC	
				pattern 1	
DRX cycle	length	S	1	OFF	
PRACH co	nfiguration index		1	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		S	1	5	
T2		ms	1	1600	Time for the UE to detect RLF
T3		S	1	6	

Table A.7.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR2

Parameter	Unit	Test	Cell 1			Cell 2			
		configuration	T1 T2 T3		T1	T2	T3		
TDD configuration		1	Т	DDConf.3.	1	Т	DDConf.3.	1	
PDSCH RMC		1	5	R.3.1 TDD	)		N/A		
configuration									
RMSI CORESET		1	C	R.3.1 TDD	)	(	CR.3.1 TDE	)	
RMC configuration									
Dedicated CORESET		1	С	CR.3.1 TDI	)	С	CR.3.1 TD	D	
RMC configuration									
TRS configuration		1	T	RS.2.1 TDI	)		N/A		
PDSCH/PDCCH TCI		1	_	TCI.State.2			N/A		
state									
OCNG Pattern		1	OP.1 c	defined in A	OP.1 defined in A.3.2.1				
Initial DL BWP		1		DLBWP.0.1		DLBWP.0.1			
configuration									
Initial UL BWP		1	ι	JLBWP.0.1		ULBWP.0.1			
configuration									
RLM-RS		1		SSB			SSB		
AoA setup		1	Setup 3	defined in A	4.3.15.3	Setup 3	defined in A.3.15.3		
$\hat{E}_{s}/I_{ot}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	8	
$N_{oc}$ Note2	dBm/15 kHz	1			-98				
$N_{oc}$ Note2	dBm/SCS	1			-89				
$\hat{E}_s/N_{oc}$	dB	1	5 -infinity -infinity		-infinity	-infinity	8		
SS-RSRP Note3	dBm/SCS	1	-84	-infinity	-infinity	-infinity	-infinity	-81	
lo	dBm/95.04 MHz	1	-53.82	-infinity	-infinity	-infinity	-infinity	-51.37	
Propagation		1			AWG		•	*	
Condition									

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable

parameters themselves.

## A.7.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than [6] s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish\_delay}}\!\!=T_{UL\_grant}+T_{UE\_re\text{-establish\_delay}}\!.$$

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{\text{freq}} = 2\,$ 

 $T_{identify\_intra\_NR} = 1600 \text{ ms}$ 

 $T_{identify\ inter\ NR} = 2080\ ms$ 

 $T_{SI} = [1280]$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

T<sub>PRACH</sub> = [15] ms; it is the additional delay caused by the random access procedure.

This gives a total of [5025] ms, allow [6] s in the test case.

## A.7.3.2.1.3 Intra-frequency RRC Re-establishment in FR2 without serving cell timing

#### A.7.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.3.1-1, table A.7.3.2.1.3.1-2 and table A.7.3.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

Table A.7.3.2.1.3.1-1: Supported test configurations

Co	onfiguration	Description
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	quired to be tested in one of the supported test configurations.

Table A.7.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter		Unit	Test configuration	Value	Comment	
Initial	Active cell		1	Cell1		
condition	Neighbour cells		1	Cell2		
Final condition	Active cell		1	Cell2		
RF Chann	el Number		1	1		
Time offse	t between cells		1	3 μs	Synchronous cells	
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers	
N311	N311		1	1	Minimum consecutive in-sync indication from lower layers	
T310		ms	1	6000	Radio link failure timer configured by RLF-TimersAndConstants	
T311		ms	1	5000	RRC re-establishment timer	
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.	
SSB config	uration		1	SSB.1 FR2		
SMTC con			1	SMTC pattern 1		
DRX cycle	length	S	1	OFF		
	onfiguration index		1	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2	
T1		S	1	5		
T2		S	1	6	Time for the UE to detect RLF	
T3		S	1	5		

Table A.7.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter	Unit	Test	Cell 1			Cell 2			
		configuration	T1	T2	T3	T1	T2	T3	
TDD configuration		1	TDDConf.3.1			Т	TDDConf.3.1		
		1		R.3.1 TDD	)		N/A		
RMSI CORESET		1	CR.3.1 FDD		)		CR.3.1 FDE	)	
RMC configuration									
Dedicated CORESET		1	CCR.3.1 FDD		С	CR.3.1 FD	D		
RMC configuration									
TRS configuration		1	Т	RS.2.1 TDI	)		N/A		
TCI state		1	CS	I-RS.Config	g.0		N/A		
OCNG Pattern		1	OP.1 c	defined in A	3.2.1	OP.1 c	defined in A	A.3.2.1	
Initial DL BWP		1	DLBWP.0.1		DLBWP.0.1				
configuration									
Initial UL BWP		1	ULBWP.0.1			ULBWP.0.1			
configuration									
RLM-RS		1		SSB			SSB		
AoA setup		1	Setup 1	defined in /	A.3.15.1	Setup 1 defined in A.3.15.1			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5	
$N_{oc}$ Note2	dBm/SCS	1			-98				
$N_{oc}$ Note2	dBm/15 kHz	1			-89				
$\hat{E}_s/N_{oc}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5	
SS-RSRP Note3	dBm/SCS	1	-93	-infinity	-infinity	-infinity	-infinity	-93	
lo	dBm/95.04 MHz	1	-62.82	-infinity	-infinity	-infinity	-infinity	-62.82	
Propagation		1	AWGN						
Condition				,					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.7.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than [5] s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish\_delay}} = T_{UL\_grant} + T_{UE\_re\text{-establish\_delay}}.$$

## Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 + T_{identify\_intra\_NR} + \sum\nolimits_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{freq} = 1$ 

 $T_{identify\_intra\_NR} = 3520 \text{ ms}$ 

 $T_{SI} = [1280]$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

 $T_{PRACH} = [15]$  ms; it is the additional delay caused by the random access procedure.

This gives a total of [4865] ms, allow [5] s in the test case.

## A.7.3.2.2 Random Access

## A.7.3.2.2.1 Contention based random access test in FR2 for NR Standalone

## A.7.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.1.1-1. UE capble of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.1.1-2 and Table A.7.3.2.2.1.1-3.

Table A.7.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR2 for NR Standalone

	Config	Description
1		NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations depending on UE
	capability	

Table A.7.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for NR Standalone

Paramet	ter	Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in FR2	As defined in A.3.10, except for for number of SSBs per SS-burst and SS/PBCH block index as below
Number of SSBs per SS	-burst		2	Different from the definition in A.3.10
SS/PBCH block index			0,1	Different from the definition in A.3.10
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	As defined in A.3.2.1.
PDSCH parameters Note 2	Config 1,2		SR3.1 TDD	As defined in A.3.1.1.
NR RF Channel Number	•		1	
EPRE ratio of PSS to SS	SS	dB		
EPRE ratio of PBCH_DN	MRS to SSS	dB		
EPRE ratio of PBCH to F	PBCH_DMRS	dB		
EPRE ratio of PDCCH_DMRS to SSS		dB	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_D	MRS to SSS	dB		
EPRE ratio of PDSCH to	PDSCH_DMRS	dB		

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.7.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for NR Standalone

	Parameter	Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.3.15.2.2.
SSB with	$\hat{E}_s/I_{ot}$	dB	4	SSB with index 0 is signalled to be above
index 0	SSB_RP	dB	[10] dB larger than SSB_RP for SSB index 1	configured rsrp- ThresholdSSB
SSB with	$\hat{E}_s/I_{ot}$	dB	-6	SSB with index 1 is signalled to be below
index 1	SSB_RP	dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	configured rsrp- ThresholdSSB
ss-PBCH-Blo	ockPower	dBm/ SCS	TBD	As defined in clause 6.3.2 in TS 38.331 [2].
Configured U $P_{ m CMAX, \ f,c}$ )	JE transmitted power (	dBm	TBD	As defined in clause 6.2.4 in TS 38.101-2.
PRACH Conf	figuration		FR2 PRACH configuration 1	As defined in A.3.8.3.
Propagation	Condition	-	AWGN	
Note 1: vo Note 2: vo				

#### A.7.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.7.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Subclause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in subclause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

### A.7.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

## A.7.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Subclause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

#### A.7.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Subclause 6.2.2.2.1.6 the System Simulator shall not send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

#### A.7.3.2.2.2 Non-contention based random access test in FR2 for NR Standalone

#### A.7.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.2.1-1. UE capble of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.2.1-2 and Table A.7.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.7.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for NR Standalone

	Config	Description
1		NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations depending on UE
	capability	

Table A.7.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR2 for NR Standalone

Parame	eter	Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in FR2	SSB pattern 1 in FR2	As defined in A.3.10, except of Number of SSBs per SS-burst and SS/PBCH block index as below
Number of SSBs per	SS-burst		2	2	Different from the definition in A.3.10
SS/PBCH block inde	ex		0,1	0,1	Different from the definition in A.3.10
CSI-RS Configuration	Config 1,2		N/A	CSI-RS.3.1 TDD	As defined in A.3.1.4
Duplex Mode for Cell 2	Config 1,2		TDD	TDD	
TDD Configuration Config 1,2			TDDConf.3.1	TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH parameters Note 2	Config 1,2		SR3.1 TDD	SR3.1 TDD	As defined in A.3.1.1.
NR RF Channel Nun	nber		1	1	
EPRE ratio of PSS to	o SSS	dB			
EPRE ratio of PBCH	_	dB			
EPRE ratio of PBCH PBCH_DMRS	to	dB			
EPRE ratio of PDCCH_DMRS to SSS		dB	0	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB	0	0	
EPRE ratio of PDSC	H_DMRS to	dB			
EPRE ratio of PDSC PDSCH_DMRS	H to	dB			

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.7.3.2.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone

Parameter  AoA setup		Unit	Test-1	Test-2	Comments
			Setup 2b	Setup 2b	As defined in A.3.15.2.2.
SSB with	$\hat{E}_s/I_{ot}$	dB	4	4	SSB with index 0 is signalled to be above
index 0	SSB_RP	dB	[10] dB larger than SSB_RP for SSB index 1	[10] dB larger than SSB_RP for SSB index 1	configured rsrp- ThresholdSSB
SSB with	$\hat{E}_s/I_{ot}$	dB			SSB with index 1 is signalled to be below
index 1	SSB_RP	dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	configured rsrp- ThresholdSSB
ss-PBCH-Blo	ockPower	dBm/ SCS	TBD	TBD	As defined in clause 6.3.2 in TS 38.331 [2].
Configured UE transmitted power ( $P_{ m CMAX, \ f,c}$ )		dBm	TBD	TBD	As defined in clause 6.2.4 in TS 38.101-2.
PRACH Configuration		-	FR2 PRACH configuration 2	FR2 PRACH configuration 3	As defined in A.3.8.3.
Propagation Note 1: vo		-	AWGN	AWGN	

Note 2: void.

#### A.7.3.2.2.2.2 **Test Requirements**

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.7.3.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the ra-ssb-OccasionMaskIndex.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Subclause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Subclause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in subclause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Subclause 6.2.2.2. The power of the first preamble shall be [TBD] dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Subclause 7.1.2.

#### A.7.3.2.3 SA: RRC Connection Release with Redirection

## A.7.3.2.3.1 Redirection from NR in FR2 to NR in FR2

## A.7.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

#### A.7.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.7.3.2.3.1.2-2, and A.7.3.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "RRCConnectionRelease" message containing the relevant system information of Cell 2 shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.7.3.2.3.1.2-1: Redirection from NR to NR test configurations

Config	Description
1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2	·	S	3	

Table A.7.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case

Davamatar	l lmi4	Cell 1		Cell 2		
Parameter	Unit	T1	T2	T1	T2	
NR RF Channel Number			1		2	
Duplex mode			Т	DD		
TDD configuration			TDDC	onf.3.1		
BW <sub>channel</sub>	MHz		100: N	<sub>RB,c</sub> = 66		
BWP BW	MHz	100: N <sub>RB,c</sub> = 66				
DRx Cycle	ms	Not Applicable				
PDSCH Reference measurement channel		SR3.1 TDD				
CORESET Reference Channel		CR3.1 TDD				
OCNG Patterns		OCNG pattern 1				
SMTC configuration		SMTC.1 FR2				
PDSCH/PDCCH subcarrier spacing	kHz		120 kHz			
PUCCH/PUSCH subcarrier spacing	kHz		120 kHz			
PRACH configuration			FR2 PRACH	configuration 1		
TRS configuration			TRS.2	2.1 TDD		

TCI configuration			CSI-RS.Config.0				
BWP configuraiton			DLBWP.0.1				
		Dedicated DL BWP			DLBW	/P.1.1	
		Initial UL BWP			ULBW	/P.0.1	
		Dedicated UL BWP		ULBWP.1.1			
	o of PSS to						
EPRE ration	o of PBCH [	MRS to SSS					
		o PBCH DMRS					
		DMRS to SSS					
		to PDCCH DMRS	dB	0		0	
		DMRS to SSS	ub l	`	U		
	o of PDSCH						
		DMRS to SSS(Note 1)					
	o of OCNG	to OCNG DMRS (Note					
1)							
$N_{oc}$ Note2		dBm/15kH z	TE	3D	Ti	BD	
M	N <sub>oc</sub> Config 1,2 Config 3			TBD		TBD	
			dBm/SCS	TBD		TBD	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD	
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		dB	TBD	TBD	TBD	TBD
Io <sup>Note3</sup>	Config 1,2	2	dBm/ BW	TBD	TBD	TBD	TBD
10	Config 3		dBm/ BW	TBD	TBD	TBD	TBD
Propagation	Propagation condition		-		AW		
Note 1: OCNG shall be used such that both			allocated and a	a constant total	transmitted po	ower spectral	
	density is achieved for all OFDM syl						
Note 2:	Interference	e from other cells and no	ise sources no	t specified in the	he test is assur	ned to be cons	stant over

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

## A.7.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [2040] ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

where:

 $T_{RRC\_procedure\_delay} = [110]$  ms and is specified in clause 12 in TS 38.331 [2].

 $T_{identify-NR} = [1760]$  ms in the test.

 $T_{SI-NR} = 0$  ms is assumed, since the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

 $T_{RACH} = [170]$  ms in the test.

This gives a total of [2040] ms.

# A.7.4 Timing

## A.7.4.1 UE transmit timing

## A.7.4.1.1 NR UE Transmit Timing Test for FR2

## A.7.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 7.4.1.1.1-1.

Table A.7.4.1.1.1-1: Supported test configurations for FR2 PCell

Configuration	Description		
1	NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz		

For this test a single NR cell is used. Table A.7.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.7.4.1.1.1-3.

Table A.7.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
E-UTRA Channel		1	1	1
Number		•	•	
NR Channel Number		1	2	2
TDD configuration		1	TDDConf.1.2	
BWchannel	MHz	1	100: NRB,c = 66	i
Initial BWP Configuration		1	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1	DLBWP.1.1 ULBWP.1.1	
		4	_	
TRS Configuration		1	TRS.2.1 TDD	
TCI State		1	CSI-RS.Config.0	
DRx Cycle	ms	1	N/A	3DRX.5 <sup>Note5</sup>
PDSCH Reference measurement channel		1	SR.3.1 TDD	
RMSI CORESET Reference Channel		1	CR.3.1 TDD	

Dedicated CORESET Reference Channel		1	CCR.3.1 TDD		
OCNG Patterns		1	OP.1		
SSB Configuration		1	SSB.2 FR2		
TCI configuration		1	TBD		
TRS configuration		1	TBD		
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS	dB	1	0	0	
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH	1				
EPRE ratio of OCNG DMRS to SSS(Note 1)	-				
EPRE ratio of OCNG to	1				
OCNG DMRS (Note 1)					
N oc	dBm/15 kHz	1	TBD	TBD	
N oc Note2	dBm/SCS	1	TBD	TBD	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		1	3	3	
$\hat{E}_s/N_{oc}$		1	3	3	
SS-RSRPNote3					
	dBm/SCS	1	TBD	TBD	
Io <sup>Note3</sup>	dBm/95MHz	1	TBD	TBD	
Propagation condition		1	AWGN		
SRS Config	SRS Config 1 Config1Note6 Config2Note6				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRx related parameters are given in Table A.3.3.5-1

Note 6: SRS configs are given in Table A.7.4.1.1.1-3

Config1 Config 2 Comments SRS-ResourceSet srs-ResourceSetId 0 srs-ResourceldList 0 0 Periodic Periodic resourceType Codebook Codebook Usage SRS-Resource SRS-Resourceld 0 0 nrofSRS-Ports Port1 Port1 transmissionComb n2 n2 combOffset-n2 0 0 cyclicShift-n2 0 0 resourceMapping 0 0 startPosition resourceMapping n1 n1 nrofSymbols resourceMapping n1 n1 repetitionFactor freqDomainPosition 0 0 freqDomainShift 0 0 freqHopping sl1 sl1 c-SRS freqHopping 0 0 b-SRS freqHopping 0 0 b-hop groupOrSequenceHopping Neither Neither resourceType Periodic Periodic periodicityAndOffset-p sl1, 0 sl640, 0 Offset to align with DRx periodicity sequenceld 0 Any 10 bit number 0

Table A.7.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

Table A.7.4.1.1.1-4: Void

## A.7.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test:

- 1) Setup NR PCell according to parameters given in Table A.7.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 13792
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.7.4.1.1.2-1

#### Table A.7.4.1.1.2-1 Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value		
	Test1	Test2	
240	+8*64T <sub>c</sub>	+4*64T <sub>c</sub>	

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within ( $N_{TA} + N_{TA\_offset}$ ) ×T<sub>c</sub>  $\pm$  T<sub>e</sub> respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX confiured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

## A.7.4.2 UE timer accuracy

## A.7.4.3 Timing advance

## A.7.4.3.1 SA FR2 timing advance adjustment accuracy

## A.7.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.7.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.7.4.3.1.2-2, A.7.4.3.1.2-3 and A.7.4.3.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.7.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.7.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3.2.1, the UE adjusts its uplink timing at slot n+k for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

Table A.7.4.3.1.2-1: Timing advance supported test configurations

Config	Description	
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	

Table A.7.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command $(T_A)$ value during T1		31	NTA_new = NTA_old for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command $(T_A)$ value during T2		39	$N_{TA\_new} = N_{TA\_old} + 8192*T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	S	5	
T2	S	5	

Table A.7.4.3.1.2-3: Cell specific test parameters for timing advance

Parameter	Unit	Test1		
Farameter		T1	T2	

Duplex mode	1	TDD	
TDD configuration		TDDConf.3.1	
BWchannel	MHz	100: N <sub>RB,c</sub> = 66	
BWP BW	MHz	100: N <sub>RB,c</sub> = 66	
DRx Cycle	ms	Not Applicable	
PDSCH Reference measurement channel	1115	SR.3.1 TDD	
CORESET Reference Channel		CR.3.1 TDD	
OCNG Patterns		OCNG pattern 1	
TRS configuration		TRS.2.1 TDD	
TCI configuration		CSI-RS.Config.0	
SMTC configuration		SMTC.1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120 kHz	
PUCCH/PUSCH subcarrier spacing	kHz	120 kHz	
EPRE ratio of PSS to SSS	1		
EPRE ratio of PBCH DMRS to SSS	_		
EPRE ratio of PBCH to PBCH DMRS	_		
EPRE ratio of PDCCH DMRS to SSS	- dB		
EPRE ratio of PDCCH to PDCCH DMRS		0	
EPRE ratio of PDSCH DMRS to SSS	1		
EPRE ratio of PDSCH to PDSCH	_		
EPRE ratio of OCNG DMRS to SSS(Note 1)	_		
EPRE ratio of OCNG to OCNG DMRS (Note			
1)	4	TDD	
UE orientation around TBD axis and TBD axis	degrees	TBD	
	dBm/15kH		
$N_{oc}^{Note2}$	Z Z	TBD	
$N_{oc}^{ m Note2}$	dBm/SCS	TBD	
$\hat{E}_{s}/I_{ot}$	dB	TBD	
$\hat{E}_s/N_{oc}$	dB	TBD	
Io <sup>Note3</sup>	dBm/ 95.04MHz	TBD	
Propagation condition	-	AWGN	
	aalla ana fullu	allo acted and a constant total transmitted newer anastral	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Field Value Comment c-SRS 16 Frequency hopping is disabled b-SRS 0 b-hop 0 freqDomainPosition 0 Frequency domain position of SRS freqDomainShift 0 groupOrSequenceHopping neither No group or sequence hopping SRS-PeriodicityAndOffset sl5=0 Once every 5 slots SSB #0 is used for SRS path loss pathlossReferenceRS ssb-Index=0 estimation nonCodebook Non-codebook based UL transmission usage startPosition resourceMapping setting. SRS on last 0 nrofSymbols symbol of slot, and 1symbols for SRS n1 without repetition. repetitionFactor n1 combOffset-n2 0 transmissionComb setting cyclicShift-n2 0 nrofSRS-Ports port1 Number of antenna ports used for SRS transmission For further information see clause 6.3.2 in TS 38.331 [2]. Note:

Table A.7.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

#### A.7.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where k = 24.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

### A.7.5 Signaling characteristics

### A.7.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.

# A.7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

#### A.7.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.1.1-1. The test parameters are given in Tables A.7.5.1.1.1-2, A.7.5.1.1.1-3, and A.7.5.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic

CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.7.5.1.1.1-1: Supported test configurations for FR2 PCell

Config	guration	Description			
1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz				
Note: The UE is only required to pass in one of the supported test configurations in FR2					

Table A.7.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

Active PCell		Parameter		Unit	Value	
RF Channel Number					Test 1	
RF Channel Number	Active PCell				Cell 1	
Duplex mode		nber				
BW   Channel	Duplex mode		Config 1		TDD	
DL initial BWP configuration	BW <sub>channel</sub>				100: N <sub>RB.c</sub> = 66	
DL dedicated BWP configuration   Config 1   DLBWP.1.1	DL initial BWP configuration					
UL initial BWP configuration						
UL dedicated BWP configuration						
TDD Configuration						
CORESET Reference Channel         Config 1         CR.3.1 TDD           SSB Configuration         Config 1         SSB.1 FR2           SMTC Configuration         Config 1         SMTC.1           PDSCH/PDCCH subcarrier         Config 1         120 KHz           spacing         Table A.3.8.3.4         SSB index assigned as RLM RS         Config 1         0,1           OCNG parameters         OP.2         OP.2         OP.2           CP length         Normal         Normal           Correlation Matrix and Antenna Configuration         2x2 Low           Out of sync         DCI format         1-0           transmission parameters         DCI format         1-0           Number of Control OFDM symbols         2           Aggregation level         CCE         8           Ratio of hypothetical PDCCH RE energy to average SSS RE energy         dB         4           DMRS precoder granularity         REG bundle size         6           DRX         OFF         Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T310 timer         ms         1000           N310         1         1           N311			3			
SSB Configuration						
SMTC Configuration         Config 1         SMTC.1           PDSCH/PDCCH subcarrier spacing         Config 1         120 KHz           SPRACH Configuration         Config 1         Table A.3.8.3.4           SSB index assigned as RLM RS         Config 1         0,1           OCNG parameters         OP.2         OP.2           CP length         Normal         2x2 Low           Out of sync transmission parameters         DCI format         1-0           Number of Control OFDM symbols         2           Aggregation level         CCE         8           Ratio of hypothetical PDCCH REenergy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy         dB         4           DMRS precoder granularity         REG bundle size         6           DRX         OFF         Gap pattern ID         gp0           Layer 3 filtering         Enabled         1           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [TCI.State.0]           CSI-RS for tracking         Config 1						
PDSCH/PDCCH subcarrier spacing						
Spacing						
PRACH Configuration         Config 1         Table A.3.8.3.4           SSB index assigned as RLM RS         Config 1         0,1           OCNG parameters         OP.2           CP length         Normal           Correlation Matrix and Antenna Configuration         2x2 Low           Out of sync         DCI format         1-0           transmission parameters         Number of Control OFDM symbols         2           Aggregation level         CCE         8           Ratio of hypothetical PDCCH RE energy to average SSS RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy         REG bundle size         6           DRX         OFF         6           DRX         OFF         Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         0           T311 timer         ms         1000           N310         1         (CSI-RS configuration         Config 1         (CSI-RS 3.3 TDD)           TCI states         [TCI.State.0]         (CSI-RS for tracking)         (Config 1         (TRS.2.1 TDD)		Subcarrier	Oomig i		120 KHZ	
SSB index assigned as RLM RS   Config 1   0,1		ration	Config 1		Table A.3.8.3.4	
OCNG parameters         OP.2           CP length         Normal           Correlation Matrix and Antenna Configuration         2x2 Low           Out of sync transmission parameters         DCI format         1-0           Number of Control OFDM symbols         2           Aggregation level         CCE         8           Ratio of hypothetical PDCCH RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy         dB         4           DMRS precoder granularity         REG bundle size           REG bundle size         6         DFF           Gap pattern ID         gp0         Enabled           Layer 3 filtering         ms         0           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]						
CP length						
Out of sync transmission parameters         DCI format Number of Control OFDM symbols         1-0           Aggregation level Ratio of hypothetical PDCCH RE energy to average SSS RE energy Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy DMRS precoder granularity         dB         4           DRX         OFF           Gap pattern ID Layer 3 filtering         MS         0           T310 timer         MS         0           T311 timer         MS         0           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]					Normal	
Out of sync transmission parameters         DCI format Number of Control OFDM symbols         1-0           Aggregation level Ratio of hypothetical PDCCH RE energy to average SSS RE energy Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy DMRS precoder granularity         dB         4           DRX         REG bundle size         6           DRX         OFF           Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]					2x2 Low	
Aggregation level			<u> </u>		1-0	
Ratio of hypothetical PDCCH RE energy to average SSS RE energy   Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy   DMRS precoder granularity   REG bundle size   6	transmission	Number of Cont	rol OFDM symbols		2	
energy to average SSS RE energy   Ratio of hypothetical PDCCH DMRS   energy to average SSS RE energy   DMRS precoder granularity   REG bundle size   6	parameters	Aggregation lev	el	CCE	8	
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy   DMRS precoder granularity   REG bundle size   6				dB	4	
energy to average SSS RE energy           DMRS precoder granularity         REG bundle size           REG bundle size         6           DRX         OFF           Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]						
DMRS precoder granularity   REG bundle size   6				dB	4	
REG bundle size         6           DRX         OFF           Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]						
DRX         OFF           Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]		DMRS precoder g			REG bundle size	
Gap pattern ID         gp0           Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]			e			
Layer 3 filtering         Enabled           T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]						
T310 timer         ms         0           T311 timer         ms         1000           N310         1         1           N311         1         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]						
T311 timer         ms         1000           N310         1           N311         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]	Layer 3 filtering				Enabled	
N310         1           N311         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]				ms	0	
N311         1           CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]				ms	1000	
CSI-RS configuration         Config 1         [CSI-RS.3.3 TDD]           TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]	N310				1	
TCI states         [TCI.State.0]           CSI-RS for tracking         Config 1         [TRS.2.1 TDD]					•	
CSI-RS for tracking Config 1 [TRS.2.1 TDD]	CSI-RS configuration Config 1					
					[TCI.State.0]	
	CSI-RS for track	ing	Config 1			
	T1			S	[1]	
T2 s [10]				S	[10]	
T3 s [12]	T3			S	[12]	
D1 s [9.64]	D1			S	[9.64]	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Table A.7.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

meter	Unit	Test 1				
		T1	T2	T3		
		Setup	3 defined in /	A.3.15		
MRS to SSS	dB		4			
EPRE ratio of PDCCH to PDCCH DMRS			0			
EPRE ratio of PBCH DMRS to SSS						
BCH DMRS	dB					
S	dB					
MRS to SSS	dB		0			
PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
Config 1	dB	1 -7 -15				
Config 1		1 -1!		-15		
Config 1	dBm/15		TDD			
	KHz		IBD			
•		TI	DL-A 30ns 75I	Hz		
Propagation condition TDL-A 30ns 75Hz  Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total						
transmitted power spectral density is achieved for all OFDM symbols.						
ntains PDCCH for UEs oth	er than the	device under	test as part of	OCNG.		
rrespond to the signal to n	oise ratio o	ver the SSS F	REs.			
es are specified for testing				one band.		
	RS to SSS PBCH DMRS SS MRS to SSS PDSCH DMRS MRS to SSS OCNG DMRS Config 1 Config 1 Config 1 Config 1 e used such that the resource spectral density is achians PDCCH for UEs other or spectral to the signal to the	MRS to SSS	T1  Setup  MRS to SSS  D PDCCH DMRS  BRS to SSS  DBCH DMRS  DBCH D	T1   T2		

Table A.7.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Field	lest 1
Field	Value
gapOffset	[0
	•

Test 1

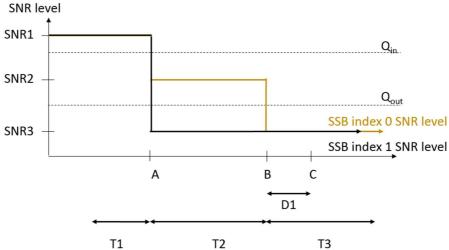


Figure A.7.5.1.1.1-1: SNR variation for out-of-sync testing

### A.7.5.1.1.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

#### A.7.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.2.1-1. The test parameters are given in Tables A.7.5.1.2.1-2, and A.7.5.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.7.5.1.2.1-1: Supported test configurations for FR2 PCell

Config	guration	Description				
1		TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz				
Note: The UE is only required to pass in one of the supported test configurations in FR2						

Table A.7.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

	Paramete	r	Unit	Value		
				Test 1		
Active PCell				Cell 1		
RF Channel No	umber			1		
Duplex mode		Config 1		TDD		
BW <sub>channel</sub>		Config 1		100: N <sub>RB,c</sub> = 66		
DL initial BWP		Config 1		DLBWP.0.1		
DL dedicated E	3WP	Config 1		DLBWP.1.1		
configuration						
UL initial BWP	configuration	Config 1		ULBWP.0.1		
UL dedicated E	3WP	Config 1		ULBWP.1.1		
configuration						
TDD Configura		Config 1		TDDConf.3.1		
CORESET Ref	ference	Config 1		CR.3.1 TDD		
Channel						
SSB Configura	ition	Config 1		SSB.1 FR2		
SMTC Configu	ration	Config 1		MTC.3 (Note SMTC periodicity		
				= 160 ms)		
PDSCH/PDCC	H subcarrier	Config 1		120 KHz		
spacing						
PRACH Config		Config 1		Table A.3.8.3.4		
SSB index ass	igned as RLM	Config 1		0,1		
RS				0.00		
OCNG parameters				OP.2		
CP length		0 " "		Normal		
	trix and Antenna	Configuration		2x2 Low		
In sync transmission	DCI format	. LOEDM		1-0		
		ntrol OFDM symbols	005	2		
parameters	Aggregation le		CCE	4		
		netical PDCCH RE	dB	0		
		rage SSS RE energy hetical PDCCH	dB	0		
		to average SSS RE	иь	0		
	energy	to average 333 NE				
	DMRS precod	er granularity		REG bundle size		
	REG bundle s			6		
Out of sync	DCI format	126		1-0		
transmission	Number of Control OFDM symbols			2		
parameters	Aggregation le		CCE	8		
	Ratio of hypotl	netical PDCCH RE	dB	4		
		age SSS RE energy	~ <b>_</b>	·		
		netical PDCCH	dB	4		
		to average SSS RE				
	energy	· ·				
DMRS precode		er granularity		REG bundle size		
REG bundle size			6			
DRX				OFF		
Gap pattern ID				N.A.		
Layer 3 filtering				Enabled		
T310 timer			ms	[6000]		
T310 timer			ms	1000		
N310			0	1		
N311				1		
CSI-RS configu	uration	Config 1		[CSI-RS.3.3 TDD]		
TCI states		- J		[TCI.State.0]		
CSI-RS for trac	cking	Config 1		[TRS.2.1 TDD]		
T1			S	[0.5]		

T2		S	[2]			
T3		S	[1.86]			
T4		S	[0.02]			
T5		S	[7]			
D1		S	[6.5]			
	: All configurations are assigned to the UE prior to the start of time period T1. 2: UE-specific PDCCH is not transmitted after T1 starts.					

Table A.7.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

	Unit			Test 1				
				T1	T2	T3	T4	T5
AoA setu	ıp		5	Setup 3 o	defined	in A.3.1	5	
EPRE ra	tio of PDCCH	dB			4			
EPRE ra	tio of PDCCH	dB			0			
EPRE ra	tio of PBCH D	dB						
EPRE ra	ratio of PBCH to PBCH DMRS dB							
EPRE ra	tio of PSS to	SSS	dB					
EPRE ra	tio of PDSCH	DMRS to SSS	dB			0		
EPRE ra	dB							
EPRE ratio of OCNG DMRS to SSS			dB					
EPRE ratio of OCNG to OCNG DMRS			dB					
ssb-Inde	x 0 SNR	dB	1	-7	-15	-4.5	1	
ssb-Inde	ssb-Index 1 SNR Config 1			1	-15	-15	-15	-15
N Config 1			dBm/1			TBD		
¹ 'oc			5KHz					
Propagat	tion condition			TDL-A 30ns 75Hz				
Note 1:	Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
Note 2:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.							
Note 3:	SNR levels	correspond to the sign	nal to nois	e ratio	over the	SSS R	Es.	
Note 4:	SNR levels correspond to the signal to noise ratio over the SSS REs.  The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.							

Table A.7.5.1.2.1-4: Void

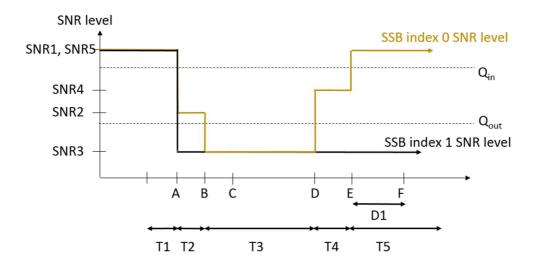


Figure A.7.5.1.2.1-1: SNR variation for in-sync testing

#### A.7.5.1.2.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

#### A.7.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.3.1-1. The test parameters are given in Tables A.7.5.1.3.1-2, and A.7.5.1.3.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.7.5.1.3.1-1: Supported test configurations for FR2 PCell

Config	guration	Description			
1		TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz			
Note:	7 - 1				
	configurations in FR2				

Table A.7.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

Active PCell RF Channel Numb Duplex mode BW <sub>channel</sub> DL initial BWP con DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration CORESET Referent Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH st spacing PRACH Configurat SSB index assigner RS OCNG parameters CP length	nfiguration P Infiguration P Infiguration P Infiguration On Subcarrier Aution ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		Test 1  Cell 1  1  TDD  100: N <sub>RB,c</sub> = 66  DLBWP.0.1  DLBWP.1.1  ULBWP.0.1  ULBWP.1.1  TDDConf.3.1  CR.3.1 TDD  SSB.1 FR2  SMTC.1  120 KHz  Table A.3.8.3.4
RF Channel Numb Duplex mode BW <sub>channel</sub> DL initial BWP con DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration TDD Configuration CORESET Referee Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH si spacing PRACH Configurat SSB index assigne RS OCNG parameters CP length	nfiguration P Infiguration P Infiguration P Infiguration On Subcarrier Aution ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		1 TDD 100: N <sub>RB,c</sub> = 66 DLBWP.0.1 DLBWP.1.1 ULBWP.0.1 ULBWP.1.1 TDDConf.3.1 CR.3.1 TDD SSB.1 FR2 SMTC.1 120 KHz
RF Channel Numb Duplex mode BW <sub>channel</sub> DL initial BWP con DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH suspacing PRACH Configuration SSB index assigner RS OCNG parameters CP length	nfiguration P Infiguration P Infiguration P Infiguration On Subcarrier Aution ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		1 TDD 100: N <sub>RB,c</sub> = 66 DLBWP.0.1 DLBWP.1.1 ULBWP.0.1 ULBWP.1.1 TDDConf.3.1 CR.3.1 TDD SSB.1 FR2 SMTC.1 120 KHz
Duplex mode BW <sub>channel</sub> DL initial BWP con DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH sispacing PRACH Configuration SSB index assigners CSB index assigners CP length	nfiguration P Infiguration P Infiguration P Infiguration On Subcarrier Aution ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		100: N <sub>RB,c</sub> = 66 DLBWP.0.1 DLBWP.1.1  ULBWP.0.1 ULBWP.1.1  TDDConf.3.1 CR.3.1 TDD  SSB.1 FR2 SMTC.1 120 KHz
BW <sub>channel</sub> DL initial BWP con DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH sispacing PRACH Configuration SSB index assigners CONG parameters CP length	Pinfiguration Pinence non subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		DLBWP.0.1 DLBWP.0.1 ULBWP.0.1 ULBWP.1.1  TDDConf.3.1 CR.3.1 TDD  SSB.1 FR2 SMTC.1 120 KHz
DL initial BWP con DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH sispacing PRACH Configuration SSB index assigned RS OCNG parameters CP length	Pinfiguration Pinence non subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		DLBWP.0.1 DLBWP.0.1 ULBWP.0.1 ULBWP.1.1  TDDConf.3.1 CR.3.1 TDD  SSB.1 FR2 SMTC.1 120 KHz
DL dedicated BWF configuration UL initial BWP con UL dedicated BWF configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH suspacing PRACH Configuration SSB index assigners CONG parameters CP length	Pinfiguration Pinence non subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		DLBWP.1.1  ULBWP.0.1  ULBWP.1.1  TDDConf.3.1  CR.3.1 TDD  SSB.1 FR2  SMTC.1  120 KHz
UL initial BWP con UL dedicated BWP configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH suspacing PRACH Configuration SSB index assigner RS OCNG parameters CP length	n ence n on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		ULBWP.1.1  TDDConf.3.1  CR.3.1 TDD  SSB.1 FR2  SMTC.1  120 KHz
UL initial BWP con UL dedicated BWP configuration TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration SMTC Configuration PDSCH/PDCCH suspacing PRACH Configuration SSB index assigner RS OCNG parameters CP length	n ence n on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		ULBWP.1.1  TDDConf.3.1  CR.3.1 TDD  SSB.1 FR2  SMTC.1  120 KHz
UL dedicated BWF configuration TDD Configuration CORESET Refered Channel SSB Configuration SMTC Configuration PDSCH/PDCCH suspacing PRACH Configuration SSB index assigners CONG parameters CP length	n ence n on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		TDDConf.3.1 CR.3.1 TDD SSB.1 FR2 SMTC.1 120 KHz
TDD Configuration CORESET Reference Channel SSB Configuration SMTC Configuration PDSCH/PDCCH subspacing PRACH Configuration PRACH Configuration SSB index assigned RS OCNG parameters CP length	ence n on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1 Config 1 Config 1		CR.3.1 TDD  SSB.1 FR2 SMTC.1 120 KHz
TDD Configuration CORESET Refered Channel SSB Configuration SMTC Configuration PDSCH/PDCCH st spacing PRACH Configurat SSB index assigner RS OCNG parameters CP length	ence n on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1		CR.3.1 TDD  SSB.1 FR2 SMTC.1 120 KHz
CORESET Reference Channel SSB Configuration SMTC Configuration PDSCH/PDCCH suspacing PRACH Configuration PRACH Configuration SSB index assigned RS OCNG parameters CP length	ence n on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1 Config 1		CR.3.1 TDD  SSB.1 FR2 SMTC.1 120 KHz
SSB Configuration SMTC Configuration PDSCH/PDCCH si spacing PRACH Configurat SSB index assigne RS OCNG parameters CP length	on subcarrier ation ed as RLM	Config 1 Config 1 Config 1 Config 1		SMTC.1 120 KHz
SMTC Configuration PDSCH/PDCCH subspacing PRACH Configuration SSB index assigner RS OCNG parameters CP length	on subcarrier ation ed as RLM	Config 1 Config 1 Config 1		SMTC.1 120 KHz
SMTC Configuration PDSCH/PDCCH subspacing PRACH Configuration SSB index assigner RS OCNG parameters CP length	on subcarrier ation ed as RLM	Config 1 Config 1 Config 1		SMTC.1 120 KHz
PDSCH/PDCCH st spacing PRACH Configurat SSB index assigne RS OCNG parameters CP length	subcarrier ation ed as RLM	Config 1 Config 1		120 KHz
spacing PRACH Configurat SSB index assigne RS OCNG parameters CP length	ation ed as RLM	Config 1		Table A.3.8.3.4
SSB index assigne RS OCNG parameters CP length	ed as RLM			Table A.3.8.3.4
SSB index assigne RS OCNG parameters CP length	ed as RLM			
RS OCNG parameters CP length		_		0,1
CP length	•			
CP length	S			OP.1
	CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low	
Out of sync D	OCI format	•		1-0
transmission N	Number of Control OFDM symbols			2
			CCE	8
R	Ratio of hypoth	hetical PDCCH RE	dB	4
er	nergy to aver	age SSS RE energy		
		hetical PDCCH	dB	4
D	MRS energy	to average SSS RE		
er	energy			
D	MRS precode	er granularity		REG bundle size
R	REG bundle si	ize		6
<b>DRX</b> Configuration	n			[DRX.3]
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310				1
N311				1
CSI-RS configuration Config 1			[CSI-RS.3.3 TDD]	
TCI states			[TCI.State.0]	
CSI-RS for tracking Config 1				[TRS.2.1 TDD]
T1		-	S	[4]
T2			S	[15]
T3			S	[15]
D1			s	[14.44]

Table A.7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Paramete	er	Unit		Test 1	
			T1	T2	T3
AoA setup		Setup 1 defined in A.3.15			
EPRE ratio of PDCCH DM	dB	4			
EPRE ratio of PDCCH to P	dB	0			
EPRE ratio of PBCH DMR	dB				
EPRE ratio of PBCH to PB	dB				
EPRE ratio of PSS to SSS	dB				
EPRE ratio of PDSCH DMI	dB		0		
EPRE ratio of PDSCH to P	dB				
EPRE ratio of OCNG DMR	dB				
EPRE ratio of OCNG to OC	CNG DMRS	dB			
ssb-Index 0 SNR	Config 1	dB	1	-7	-15
ssb-Index 1 SNR	Config 1		1	-15	-15
$N_{oc}$	dBm/15K Hz	TBD			
Propagation condition		TDL-A 30ns 75Hz			
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total					

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.7.5.1.3.1-4: Void
Table A.7.5.1.3.1-5: Void

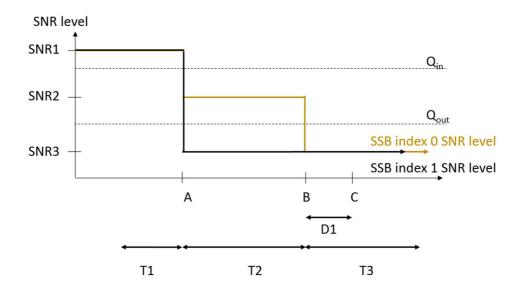


Figure A.7.5.1.3.1-1: SNR variation for out-of-sync testing

#### A.7.5.1.3.2 Test Requirements

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

#### A.7.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables A.7.5.1.4.1-2, and A.7.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when Onduration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Editor note: AoA setting needs to be updated.

Table A.7.5.1.4.1-1: Supported test configurations for FR2 PCell

Config	uration	Description		
1		TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz		
Note:	Note: The UE is only required to pass in one of the supported test configurations in FR2			

Table A.7.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode

	Parameter	•	Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number		1		1
Duplex mode		Config 1		TDD
BW <sub>channel</sub>		Config 1		100: N <sub>RB,c</sub> = 66
DL initial BWP		Config 1		DLBWP.0.1
DL dedicated E configuration	SVVP	Config 1		DLBWP.1.1
UL initial BWP	configuration	Config 1		ULBWP.0.1
UL dedicated E		Config 1		ULBWP.1.1
configuration				
TDD Configura	tion	Config 1		TDDConf.3.1
CORESET Ref	erence	Config 1		CR.3.1 TDD
Channel				
SSB Configura		Config 1		SSB.1 FR2
SMTC Configu		Config 1		MTC.3(SMTC
PDSCH/PDCC	H subcarrier	Config 1		120 KHz
spacing PRACH Config	uration	Config 1		Table A.3.8.3.4
SSB index ass		Config 1 Config 1		0,1
RS	igned as INLIVI	Coming		0,1
OCNG parame	ters	1		OP.1
CP length				Normal
	trix and Antenna	Configuration		2x2 Low
In sync	DCI format			1-0
transmission		ntrol OFDM symbols		2
parameters	Aggregation le		CCE	4
		netical PDCCH RE	dB	0
	Ratio of hypoth	age SSS RE energy	dB	0
		to average SSS RE	иь	O
	energy	to average eee re		
	DMRS precode	er granularity		REG bundle size
	REG bundle si			6
Out of sync	DCI format			1-0
transmission		ntrol OFDM symbols		2
parameters	Aggregation le		CCE	8
		netical PDCCH RE	dB	4
	Ratio of hypoth	age SSS RE energy	dB	4
		to average SSS RE	uБ	4
	energy	to avolago coo me		
	DMRS precode	er granularity		REG bundle size
	REG bundle si	ze		6
DRX Configura				[DRX.3]
Gap pattern ID				N.A.
Layer 3 filtering			Enabled	
T310 timer T311 timer		ms	[6000]	
N310		ms	1000 1	
N310				1
	CSI-RS configuration Config 1			[CSI-RS.3.3 TDD]
	TCI states			[TCI.State.0]
CSI-RS for tracking Config 1		Config 1		[TRS.2.1 TDD]
T1		<u> </u>	S	[4]
T2	T2			[6]
T3				[5.54]
T4			S	[0.02]
T5			S	[7]

D1		S	[6.5]
Note 1:	e 1: All configurations are assigned to the UE prior to the start of time period T1.		
Note 2:			

Table A.7.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode

Pa	rameter	Unit	Test 1				
		T1	T2	T3	T4	T5	
AoA setup				Setup 1	defined	in A.3.1	5
EPRE ratio of PDCC	H DMRS to SSS	dB			4		
EPRE ratio of PDCC	H to PDCCH DMRS	dB			0		
EPRE ratio of PBCH	DMRS to SSS	dB					
EPRE ratio of PBCH	to PBCH DMRS	dB					
EPRE ratio of PSS to	SSS	dB					
EPRE ratio of PDSCI	H DMRS to SSS	dB			0		
EPRE ratio of PDSCI	H to PDSCH DMRS	dB					
EPRE ratio of OCNG	DMRS to SSS	dB					
EPRE ratio of OCNG	to OCNG DMRS	dB					
ssb-Index 0 SNR	Config 1	dB	1	-7	-15	-4.5	1
ssb-Index 1 SNR	Config 1		1	-15	-15	-15	-15
$N_{oc}$ Config 1		dBm/1 5KHz			TBD		
Propagation condition			TDL	-A 30ns	75Hz		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3							
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.							

The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is Note 4: A.3.6.

Table A.7.5.1.4.1-4: Void Table A.7.5.1.4.1-5: Void

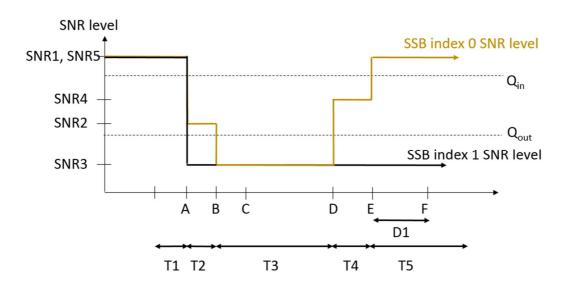


Figure A.7.5.1.4.1-1: SNR variation for in-sync testing

#### A.7.5.1.4.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.5 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

#### A.7.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.5.1-1, A.7.5.1.5.1-2, A.7.5.1.5.1-3 and A.7.5.1.5.1-4 below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.5.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

Table A.7.5.1.5.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.7.5.1.5.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
CORESET	Config 1		CR.3.1 TDD
Reference Channel			
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing			
csi-RS-Index assigned	I as RLM RS		[0]
TRS configuration			TRS.2.1 TDD
TCI configuration			CSI-RS.Config.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE		
	energy		
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS		
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			*[ <i>gp0</i> ]
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.3.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.44]
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.7.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3		
PDCCH_b	eta	dB	4				
PDCCH_I	DMRS_beta	dB		4			
PBCH_be	ta	dB					
PSS_beta	1	dB					
SSS_beta		dB	0				
PDSCH_b	eta	dB					
OCNG_be	eta	dB	7				
SNR	Config 1	dB	[1]	[-7]	[-15]		
$N_{oc}$	Config 1	dBm/15KHz	[-98]				
Propagation condition			[TDL-C 300ns 100Hz]				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.5.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.7.5.1.5.1-4: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field		Test 1	
	Field		
	gapOffset	[0]	
Note 1:	ped with		
	measurement gap		

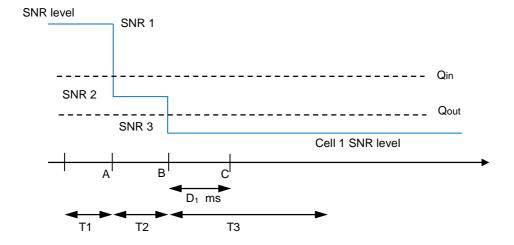


Figure A.7.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.7.5.1.5.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1 = [TBD]$  ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.6 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

#### A.7.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.6.1-1, A.7.5.1.6.1-2 and A.7.5.1.6.1-3 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.6.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.7.5.1.6.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.7.5.1.6.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number	_		1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
CORESET	Config 1		CR.3.1 TDD
Reference Channel			
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing			
csi-RS-Index assigned	d as RLM RS		[0]
TRS configuration			TRS.2.1 TDD
TCI configuration			CSI-RS.Config.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
	DCI format		1-0
	Number of Control OFDM		2
Out of sync	symbols		
transmission	Aggregation level	CCE	8
parameters	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE		
	energy		
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS		
	RE energy		DEC hundle sine
	DMRS precoder granularity		REG bundle size
la arma tuananianian	REG bundle size		6
In sync transmission	DCI format  Number of Control OFDM		<u>1-0</u> 2
parameters			2
	symbols Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE	dB	<u>4</u> 
	energy to average CSI-RS RE	uБ	U
	energy to average CSI-NS NE		
	Ratio of hypothetical PDCCH	dB	0
	DMRS energy to average CSI-RS	42	•
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX	1		OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration   Config 1			CSI-RS.3.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.24]
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.7.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

	Parameter	Unit	Test 1				
			T1	T2	Т3	T4	T5
PDCCH_b	eta	dB			4		
PDCCH_E	DMRS_beta	dB			4		
PBCH_be	ta	dB					
PSS_beta		dB					
SSS_beta		dB			0		
PDSCH_b	eta	dB					
OCNG_be	eta	dB					
SNR	Config 1	dB	[1]	[-7]	[-15]	[-4.5]	[1]
$N_{oc}$	Config 1	dBm/15KHz	[-98]			-	
Propagation condition				[TD	L-C 300ns 10	00Hz]	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

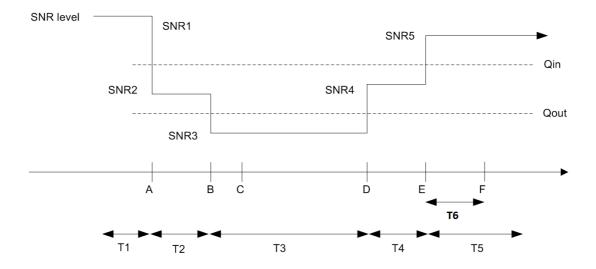


Figure A.7.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.7.5.1.6.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.7 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

#### A.7.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.7.1-1, A.7.5.1.7.1-2, and A.7.5.1.7.1-3 below. There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.7.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements without gaps.

Table A.7.5.1.7.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.7.5.1.7.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
CORESET	Config 1		CR.3.1 TDD
Reference Channel			
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing			
csi-RS-Index assigned	as RLM RS		[0]
TRS configuration			TRS.2.1 TDD
TCI configuration			CSI-RS.Config.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE		
	energy		
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS		
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.7
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration   Config 1			CSI-RS.3.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.24]
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.7.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode

	Parameter	Unit	Test 1		
			T1	T2	T3
PDCCH_beta		dB		4	
PDCCH_C	MRS_beta	dB		4	
PBCH_bet	ta	dB			
PSS_beta		dB			
SSS_beta		dB		0	
PDSCH_b	eta	dB			
OCNG_be	ta	dB			
SNR	Config 1	dB	[1]	[-7]	[-15]
$N_{oc}$	Config 1	dBm/15KHz	[-98]		
Propagatio	on condition		[TDL-C 300ns 100Hz]		

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.7.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

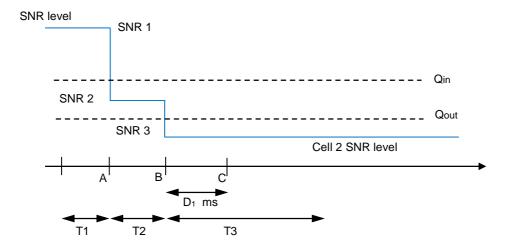


Figure A.7.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.7.5.1.7.2 Test Requirements

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1 = [TBD]$  ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.1.8 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

#### A.7.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.8.1-1, A.7.5.1.8.1-2, A.7.5.1.8.1-3 and A.7.5.1.8.1-4 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [10] ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

Table A.7.5.1.8.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.7.5.1.8.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
CORESET	Config 1		CR.3.1 TDD
Reference Channel			
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing			
csi-RS-Index assigned	as RLM RS		[0]
TRS configuration			TRS.2.1 TDD
TCI configuration			CSI-RS.Config.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE		
	energy	in .	
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS		
	RE energy  DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM		2
parameters	symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE	dB	0
	energy to average CSI-RS RE	QD	Ü
	energy		
	Ratio of hypothetical PDCCH	dB	0
	DMRS energy to average CSI-RS		-
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.7
Gap pattern ID			*[ <i>gp0</i> ]
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.3.2 TDD
T1		S	1
T2		S	0.4
T3		S	[0.6]
D1		S	[0.44]
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.7.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

	Parameter	Unit		Test 1			
			T1	T2	T3	T4	T5
PDCCH_b	eta	dB			4		
PDCCH_E	DMRS_beta	dB			4		
PBCH_be	ta	dB					
PSS_beta		dB					
SSS_beta		dB			0		
PDSCH_b	eta	dB					
OCNG_be	eta	dB					
SNR	Config 1	dB	[1]	[-7]	[-15]	[-4.5]	[1]
$N_{oc}$	Config 1	dBm/15KHz	[-98]				
Propagation condition			[TDL-C 300ns 100Hz]				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.7.5.1.8.1-4: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in non-DRX mode

	Field	Test 1 Value		
	gapOffset	[0]		
Note 1:	Note 1: RLM RS is partially overla			
	measurement gap			

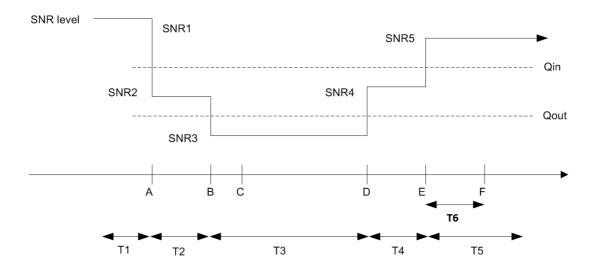


Figure A.7.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

#### A.7.5.1.8.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

#### A.7.5.1.9 UE Radio Link Monitoring Scheduling Restrictions on FR2

#### A.7.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly, under the condition that the SSB is with different numerology as the PDCCH/PDSCH.

The test parameters are given in table A.7.5.1.9.1-1, table A.7.5.1.9.1-2 and table A.7.5.1.9.1-3 below. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

Table A.7.5.1.9.1-1: Supported test configurations

Configuration		Description
1		120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	quired to be tested in one of the supported test configurations.

Table A.7.5.1.9.1-2: General test parameters for NR RLM scheduling restriction test case in FR2

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		1	1	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC	
			pattern 1	
DRX cycle length	S	1	OFF	
T1	S	1	5	During T1 the UE is required to correctly transmit ACK/NACK

Table A.7.5.1.9.1-3: Cell specific test parameters for NR RLM scheduling restriction test case in FR2

Parameter	Unit	Test	Се	II 1
		configuration	AoA1	AoA2
TDD configuration		1	TDDC	onf.3.1
PDSCH RMC		1	SR.3.1 TDD	Not sent
configuration				
RMSI CORESET		1	CR.3.1 TDD	Not sent
RMC configuration				
Dedicated CORESET		1	CCR.3.2 TDD	Not sent
RMC configuration				
TRS configuration		1	TRS.2.1 TDD	[TRS.2.2 TDD]
PDCCH/PDSCH TCI		1	TCI.State.2	N/A
state				
OCNG Pattern		1	OP.1 defined in	Not sent
			A.3.2.1	
Initial DL BWP		1	DLBWP.0.1	
configuration				
Initial UL BWP		1	ULBV	/P.0.1
configuration				
RLM-RS		1	TRS.2.1 TDD	[TRS.2.2 TDD]
AoA setup		1		ed in A.3.15.3
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	3	N/A
$N_{oc}$ Note2	dBm/SCS	1	-84.9	Not sent
$\hat{E}_s/N_{oc}$	dB	1	3	N/A
SS-RSRP Note3	dBm/SCS	1	-81.9	-81.9
lo	dBm/95.04 MHz	1	-51.15	-52.91
Propagation		1	AWGN	
Condition				

#### A.7.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

### A.7.5.2 Interruption

### A.7.5.2.1 Interruptions during measurements on deactivated NR SCC in FR2

#### A.7.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.7.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.7.5.2.1.1-2 and A.7.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, PCell is continuously scheduled in DL.

Table A.7.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

	Config Description			
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode		
Note	e: The UE is only re	equired to be tested in one of the supported test configurations		

Table A.7.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated SCell		Cell2	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell 2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.7.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter	Unit	Cell1	Cell2	
Frequency Range		FR2	2	
Duplex mode		TDD		
TDD configuration		TDDConf.3.1		
BW <sub>channel</sub>		100 MHz: N		
Initial DL BWP		DLBWP.0		
Configuration			·- <u>-</u>	
Initial UL BWP		ULBWP.0	2 Note6	
Configuration		025111.0		
PDSCH Reference		SR.3.1	TDD	
measurement		511.6.1	. 55	
channel				
RMSI CORESET		CR.3.1	TDD	
parameters		011.0.1	. 55	
Dedicated		CCR.3.1	TDD	
CORESET		0011.5.1	100	
parameters				
OCNG Patterns		OP.1		
SMTC Configuration		SMTC.1		
SSB Configuration		SSB.1 FR2		
TCI State		TRS.2.1 TDD		
TRS Configuration		TCI.State.0		
Correlation Matrix and Antenr	na	1x2 Low		
Configuration	ia l	TAZ EX	SVV	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SS	SS			
EPRE ratio of PBCH to PBCH DN				
EPRE ratio of PDCCH DMRS to				
EPRE ratio of PDCCH to PDCCH				
EPRE ratio of PDSCH DMRS to 3	SSS dB	0	0	
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to				
SSS(Note 1)	1400			
EPRE ratio of OCNG to OCNG D	MRS			
(Note 1) È <sub>s</sub> /N <sub>oc</sub>	dB	17	17	
Time offset to cell1 Note 2	μѕ	33	33	
Time offset to cell2 Note 3	μs	-	3	
Propagation Condition		AWGN		

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
- Note 3: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
- Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of of TS 38.213 [3].

Table A.7.5.2.1.1-4: OTA related test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parar	neter	Unit	Cell 1	Cell 2
Angle of arrival config	guration		According to table A.3.15	According to table A.3.15
	NR_TDD_FR2_A NR_TDD_FR2_B	dBm/15kHz	TBD	TBD

	NR_TDD_FR2_F							
$N_{oc}$ Note1	NR_TDD_FR2_G							
OC .	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
	NR_TDD_FR2_A							
	NR_TDD_FR2_B							
$N_{oc}$ Note1	NR_TDD_FR2_F	4D/CCC	TDD	TBD				
00	NR_TDD_FR2_G	dBm/SCS	TBD	טפו				
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
	NR_TDD_FR2_A							
	NR_TDD_FR2_B		TBD					
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/120KH		TBD				
33-N3NF	NR_TDD_FR2_G	z Note3		100				
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
$\hat{E}_{_{ m s}}/I_{_{ m ot}}$		dB	TBD	TBD				
37 01	NR TDD FR2 A							
	NR_TDD_FR2_B							
	NR TDD FR2 F	dBm/95.04						
Io <sup>Note2</sup>	NR TDD FR2 G	MHz Note4	TBD	TBD				
	NR TDD FR2 T	141112						
	NR TDD FR2 Y							
Note 1: Interference	ce from other cells and	noise sources n	ot specified in the tes	t is assumed to be				
	constant over subcarriers and time and shall be modelled as AWGN of appropriate power							
for $IV_{oc}$ to	for $N_{oc}$ to be fulfilled.							

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone Note 4:

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.5.2.1.2 **Test Requirements**

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on PCell shall not exceed the value defined in Table A.7.5.2.1.2-1 if the PCell is not in the same band as the deactivated SCell or Table A.7.5.2.1.2-2 if the PCell is in the same band as the deactivated SCell.

Table A.7.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated **SCell** 

μ	NR Slot length (ms)	Interruption length
3	0.125	4

Table A.7.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	4 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.5.3 SCell Activation and Deactivation Delay

#### A.7.5.3.1 SCell Activation and deactivation for SCell in FR2 intra-band in non-DRX

#### A.7.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1 except the PCell and SCell are in FR2 intra-band.

The supported test configurations are shown in table A.7.5.3.1.1-1 below. The general test parameters are the same as defined in Table A.6.5.3.1.1-2 except those described in Tables A.7.5.3.1.1-2, and cell specific test parameters are described in Tables A.7.5.3.1.1-3. OTA related test parameters are shown in table A.7.5.3.1.1-4 below.

Table A.7.5.3.1.1-1: Supported test configurations for FR2 SCell activation case

Configuration Description						
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
Note: The UE i	s only required to pass in one of the supported test configurations					

#### Table A.7.5.3.1.1-2: General test parameters for FR2 SCell activation case

Parameter	Unit	Value	Comment
RF Channel Number		1	One NR radio channel is used for this test,
		ı	cell 1 and cell2 use the same RF channel.

#### Table A.7.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case

Parameter <sup>Note 5</sup>	l Init	Т	1	Т	2	T	3
Farameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2

SSB ARFCN		fre	ea2	freq2 freq2 freq2						
Duplex mode			DD		DD		)D			
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	TDDConf.3.1			
Downlink initial BWP Configuration		DLBV	VP.0.1	DLBW	/P.0.1	DLBV	/P.0.1			
Downlink dedicated BWP Configuration		DLBV	VP.1.1	DLBW	/P.1.1	DLBV	/P.1.1			
Uplink initial BWP configuration		ULBV	VP.0.1	ULBW	/P.0.1	ULBV	/P.0.1			
Uplink dedicated BWP configuration		ULBV	VP.1.1	ULBW	/P.1.1	ULBV	/P.1.1			
TRS configuration		TRS.2	.1 TDD	TRS.2.	.1 TDD	TRS.2	.1 TDD			
TCI state		TCI.S	state.0	TCI.S	tate.0	TCI.S	tate.0			
BW <sub>channel</sub>	MHz	100: N	RB,c = 66	100: N <sub>F</sub>	RB,C = 66	100: N <sub>F</sub>	RB,C = 66			
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-	SR.3.1 TDD	-			
RMSI CORESET Parameters		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-			
Dedicated CORESET Parameters		CCR.3. 1 TDD	-	CCR.3. 1 TDD	-	CCR.3. 1 TDD	-			
OCNG Patterns				OF	P.1	•	•			
SSB Configuration				SSB.	1 FR2					
SMTC Configuration				SMT	ΓC.1					
EPRE ratio of PSS to SSS										
EPRE ratio of PBCH_DMRS to SSS										
EPRE ratio of PBCH to PBCH_DMRS										
EPRE ratio of PDCCH_DMRS to SSS										
EPRE ratio of PDCCH to PDCCH_DMRS	dB			(	)					
EPRE ratio of PDSCH_DMRS to SSS	uБ			,	J					
EPRE ratio of PDSCH to PDSCH_DMRS										
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>										
EPRE ratio of OCNG to OCNG DMRS Note										
Propagation conditions		AWGN								

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: All parameters apply for configuration 1 and 2

Table A.7.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case

Parameter		Unit	T	1	Т	2	Т	3
		Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration			Setup 1	defined	Setup 1	defined	Setup 1	defined
Angle of arrival confi	guration		in clause	A.3.15.1	in clause	A.3.15.1	in clause	A.3.15.1
	NR_TDD_FR2_A							
	NR_TDD_FR2_B		kHz [-84.9]		[-84.9]		[-84.9]	
$N_{oc}$ Note1	NR_TDD_FR2_F	JD /4 ELLL-						
OC.	NR_TDD_FR2_G	dBm/15kHz						
	NR_TDD_FR2_T	1						
	NR_TDD_FR2_Y							
	NR_TDD_FR2_A							
	NR_TDD_FR2_B	4D~~/CCC						
SS-RSRPNote2	NR_TDD_FR2_F	dBm/SCS Note3	[0]	[0]	[0]	[0]	[0]	[0]
	NR_TDD_FR2_G							
	NR TDD FR2 T	1						

	NR_TDD_FR2_Y							
$\mathbf{\hat{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	[0]	[0]	[0]	[0]	[0]	[0]
$\hat{E}_s/N_{oc}$		dB	[0]	[0]	[0]	[0]	[0]	[0]
Io <sup>Note2</sup>	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dBm/95.04 MHz <sup>Note4</sup>	[-5:	2.9]	[-52	2.9]	[-5.	2.9]

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.5.3.1.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $[T_{SMTC\_SCell} + 5ms]$  as defined in clause 8.3.

# A.7.5.3.2 SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2 in non-DRX

### A.7.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.7.5.3.1.1 except the PCell is in FR1 and SCell is in FR2.

The supported test configurations are the same as defined in Table A.7.5.3.2.1-1. The general test parameters are the same as defined in Table A.6.5.3.1.1-2. And cell specific test parameters are described in Tables A.7.5.3.2.1-2. OTA related test parameters are the same as defined in Table A.7.5.3.1.1-4.

Table A.7.5.3.2.1-1: Supported test configurations for FR2 SCell activation case

Configuration	Description
1	PCell: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target SCell: 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	PCell: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target SCell: 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	PCell: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target SCell: 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE	is only required to pass in one of the supported test configurations

Table A.7.5.3.2.1-2: Cell specific test parameters for FR2 SCell activation case

Parameter <sup>Note 5</sup>		Unit	Т	1	Т	2	T	3
Faia	meter	Onit	Cell 1 Cell 2 Cell 1		Cell 2	Cell 1	Cell 2	
SSB ARFCN			Freq1	Freq2	Freq1	Freq2	Freq1	Freq2
Duplex mode	Config 1		FDD	TDD	FDD	TDD	FDD	TDD
	Config 2,3				TDD	1		

TDD configuration	Config 1		Not	I	Not	I	Not	
TDD configuration	Config 1		Not Applicabl		Not Applica		Not Applica	
				TDDConf	ble	TDDCo	ble	TDDCo
	Carffe 0.0		e TDDC==f	.3.1		nf.3.1		nf.3.1
	Config 2,3		TDDConf		TDDCo		TDDCo	
Downlink initial			.1.1		nf.1.1		nf.1.1	
	Config 1,2,3				DLBWP	.0.1		
BWP Configuration	• • •		DI DIVID 4	DI DIA/D	DI DIA	DI DIA	DI DIA	DI DW
Downlink dedicated	Config 1,2,3		DLBWP.1	DLBWP.	DLBW	DLBW	DLBW	DLBW
BWP Configuration	_		.1 ULBWP.0	1.1	P.1.1	P.1.1	P.1.1	P.1.1
Uplink initial BWP	Config 1,2,3			ULBWP.	ULBW	ULBW	ULBW	ULBW
configuration	•		.1 ULBWP.1	0.1	P.0.1	P.0.1	P.0.1	P.0.1
Uplink dedicated	Config 1,2,3			ULBWP.	ULBW	ULBW	ULBW	ULBW
BWP configuration	_		.1 N/A	1.1 TRS.2.1	P.1.1 N/A	P.1.1 TRS.2.	P.1.1 N/A	P.1.1 TRS.2.
TRS configuration	Config 1,2,3		IN/A	TDD	IN/A	1 TDD	IN/A	1 TDD
TOLetete	_		TOL Ctata		TOL 04-		TOL 04-	
TCI state	Config 1,2,3		TCI.State.	TCI.Stat	TCI.Sta	TCI.Sta	TCI.Sta	TCI.Sta
DIA	•	N 41 1-	0	e.0	te.0	te.0	te.0	te.0
BW <sub>channel</sub>	0	MHz	10: N <sub>RB,c</sub>		10:		10:	
	Config 1,2		= 52	100:	N <sub>RB,c</sub> =	100:	N <sub>RB,c</sub> =	100:
			40 N	N <sub>RB,c</sub> =	52 40:	N <sub>RB,c</sub> =	52	$N_{RB,c} =$
	Cartin 0		40: N <sub>RB,c</sub> = 106	66		66	40:	66
	Config 3		= 106		N <sub>RB,c</sub> = 106		N <sub>RB,c</sub> = 106	
			SR.1.1	<u> </u>	SR.1.1		SR.1.1	
	Config 1		FDD		FDD		FDD	
PDSCH Reference		•	SR.1.1		SR.1.1		SR.1.1	
measurement	Config 2		TDD	-	TDD	-	TDD	-
channel			SR.2.1		SR.2.1		SR.2.1	
	Config 3		TDD		TDD		TDD	
			CR.1.1		CR.1.1		CR.1.1	
	Config 1		FDD		FDD		FDD	
RMSI CORESET			CR.1.1		CR.1.1		CR.1.1	
Parameters	Config 2		TDD	-	TDD	-	TDD	-
1 didilictors			CR.2.1		CR.2.1		CR.2.1	
	Config 3		TDD		TDD		TDD	
			CCR.1.1		CCR.1.		CCR.1.	
	Config 1		FDD		1 FDD		1 FDD	
Dedicated			CCR.1.1		CCR.1.		CCR.1.	
CORESET	Config 2		TDD	-	1 TDD	-	1 TDD	-
Parameters			CCR.2.1	1	CCR.2.		CCR.2.	
	Config 3		TDD		1 TDD		1 TDD	
OCNG Patterns	l			I	OP.			
	0 " 16		SSB.1		SSB.1		SSB.1	
000 " "	Config 1,2		FR1	SSB.3	FR1	SSB.3	FR1	SSB.3
SSB configuration	0 " 0	1	SSB.2	FR2	SSB.2	FR2	SSB.2	FR2
	Config 3		FR1		FR1		FR1	
SMTC configuration					SMTC	.1		
EPRE ratio of PSS to SSS								
	EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS		1						
EPRE ratio of PDCCH to PDCCH_DMRS					_			
EPRE ratio of PDSCH_DMRS to SSS		dB			0			
EPRE ratio of PDSCH_DMRS		1						
EPRE ratio of OCNG		1						
	to OCNG DMRS Note							
1	Jones Divinto							
Propagation condition	ns		1		AWG	N		
Propagation conditions AWGN								

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: All parameters apply for configuration 1 and 2

#### A.7.5.3.2.2 Test Requirements

The test requirements defined in clause A.7.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [TBD] as defined in clause 8.3.

## A.7.5.4 UE UL carrier RRC reconfiguration Delay

## A.7.5.5 Beam Failure Detection and Link recovery procedures

## A.7.5.5.1 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

## A.7.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.1.1-1, A.7.5.5.1.1-2, A.7.5.5.1.1-3 and A.7.5.5.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.7.5.5.1.1-1: Supported test configurations for FR2 PCell

Cor	nfiguration	Description		
1		TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth		
2		TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR2				

Table A.7.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit	Value	Comment
		Test 1	

Active PCell   RF Channel Number	A 11 F	20 "			0.114	
Duplex mode	Active PCell				Cell 1	
BWchement					-	
DL Initial BWP   Config 1, 2   DLBWP.0.1						
Configuration   DL dedicated   Config 1, 2   DLBWP.1.1					DI RW/D 0 1	
DL dedicated BWP   Config 1, 2   DLBWP.1.1			Coming 1, 2		DEBWI .O.1	
BWP			Config 1 2		DI BWP 1 1	
configuration         UL initial BWP config 1, 2 config 1, 2         ULBWP.0.1           UL dedicated BWP configuration         Config 1, 2         ULBWP.1.1           TDD         Config 1, 2         ULBWP.1.1           CORESET Reference Channel         Config 1, 2         CR. 3.1 TDD           SSB         Config 1, 2         SSB.1 FR2           Configuration         SMTC.1         SMTC.1           SMTC Configuration         Config 1, 2         SMTC.1           PDSCH/PDCC H subcarrier spacing         SSB index assigned as BFD RS (qo)         O           SSB index assigned as SBD RS (qo)         O         O           SSB index assigned as CBD RS (qo)         Table A.3.8.3.4           TCI Configuration         Config 1, 2         TBD           OCNG parameters         OP.1         DP.1           CP length         Normal         Normal           Correlation Matrix and Antenna Configuration         1-O         Normal           OFDM symbols railing rai		ioatoa	001g 1, 2		525***	
UL initial BWP   Config 1, 2		ration				
UL dedicated BWP configuration			Config 1, 2		ULBWP.0.1	
BWP	configu	ration				
Configuration         Config 1, 2         TDDConf.3.1           CORESET Reference Channel         Config 1, 2         CR. 3.1 TDD           CORESET Reference Channel         Config 1, 2         SSB.1 FR2           Configuration         Config 1, 2         SMTC.1           Configuration         Config 1, 2         120 KHz           PDSCH/PDCC H Subcarrier Spacing         Config 1, 2         Table A.3.8.3.4           PRACH Configuration         Config 1, 2         Table A.3.8.3.4           SSB index assigned as BFD RS (q <sub>0</sub> )         0         0           SSB index assigned as CBD RS (q <sub>0</sub> )         1         TBD           TCI Configuration         Config 1, 2         TBD           CONG parameters         OP.1         OP.1           COP length         Normal         Normal           Correlation Matrix and Antenna Configuration         2x2 Low           Configuration Matrix and Antenna Configuration         2x2 Low           Computation Support		icated	Config 1, 2		ULBWP.1.1	
TDD						
Configuration  CORESET Reference Channel  SSB Config 1, 2 Configuration  SMTC Configuration  PDSCH/PDCC H subcarrier spacing  PRACH Configuration  Config 1, 2 Configuration  Config 1, 2 Table A.3.8.3.4  Configuration  SSB index assigned as BFD RS (q <sub>1</sub> )  SSB index assigned as CBD RS (q <sub>1</sub> )  TCI Configuration  Config 1, 2 TBD  Configuration  Configuration  Config 1, 2 TBD  Configuration  Configuration  Config 1, 2 TBD  Configuration  Configuration  Config 1, 2 TBD  Configuration  Configuration  Configuration  Configuration  Correlation Matrix and Antenna Correlation Matrix and Antenna Correlation Matrix and Antenna Correlation Matrix and Antenna Configuration  DCI format Number of Control OPDM symbols Aggregation level Ratio of hypothetical detection trans missi on para meter S Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size  REG bundle size		ration				
CORESET   Reference   Channel   CR. 3.1 TDD			Config 1, 2		TDDConf.3.1	
Reference Channel         Config 1, 2         SSB 1 FR2           SMTC Configuration         Config 1, 2         SMTC.1           PDSCH/PDCC H subcarrier spacing         Config 1, 2         120 KHz           PRACH Configuration         Config 1, 2         Table A.3.8.3.4           SSB index assigned as BFD RS (q0)         0           SSB index assigned as CBD RS (q1)         1           TCI Configuration         Config 1, 2         TBD           OCNG parameters         OP.1         OP.1           CP length         Normal         Normal           Correlation Matrix and Antenna Configuration         2x2 Low           Configuration         2         OP.1           CP length         Normal         1-0           Correlation Matrix and Antenna Configuration         2x2 Low           Configuration         2         OP.1           CP length         0         0           Aggregation level edetection trans missis on para meters         0         0           PDCCH RE energy to average CSI-RS RE energy to average CSI-RS RE energy to average CSI-RS RE energy         0           DMRS precoder granularity         Ratio of hypothetical pDCCH DMRS energy to average CSI-RS RE energy         0           DMRS precoder granularity         REG bundle size			0 " 1		00.04.700	
Channel   SSB   Config 1, 2   SSB.1 FR2			Config 1		CR. 3.1 IDD	
SSB						
SMTC		<b>7</b> 1	Config 1 2		SSR 1 FR2	
SMTC   Configuration   Config 1, 2		ıration	Coming 1, Z		JJD. I FNZ	
Configuration  PDSCH/PDCC	Comige	ilation				
Configuration  PDSCH/PDCC	SMTC		Config 1, 2		SMTC.1	
H subcarrier spacing  PRACH Configuration  SSB index assigned as BFD RS (q0)  SSB index assigned as CBD RS (q1)  TCI Configuration  Configuration  Configuration  Configuration  Correlation Matrix and Antenna Configuration  DCI format Number of Control OFDM symbols failur Aggregation level e Ratio of hypothetical detection average CSI-RS RE energy it average CSI-RS RE energy  Ratio of hypothetical on average CSI-RS RE energy  DDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size granularity  REG bundle size  Table A.3.8.3.4  Table A.3.8.3.4  Table A.3.8.3.4   Table A.3.8.3.4   Table A.3.8.3.4  Configuration  0  Combiguration  1  Again Antenna 2x2 Low  CCE 8  Again of hypothetical dB  O  DCCH RE energy to average CSI-RS RE energy  average CSI-RS RE energy  EGG bundle size  REG bundle size		ıration	J ,			
H subcarrier spacing  PRACH Configuration  SSB index assigned as BFD RS (q0)  SSB index assigned as CBD RS (q1)  TCI Configuration  Configuration  Configuration  Configuration  Correlation Matrix and Antenna Configuration  DCI format Number of Control OFDM symbols failur Aggregation level e Ratio of hypothetical detection average CSI-RS RE energy it average CSI-RS RE energy  Ratio of hypothetical on average CSI-RS RE energy  DDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size granularity  REG bundle size  Table A.3.8.3.4  Table A.3.8.3.4  Table A.3.8.3.4   Table A.3.8.3.4   Table A.3.8.3.4  Configuration  0  Combiguration  1  Again Antenna 2x2 Low  CCE 8  Again of hypothetical dB  O  DCCH RE energy to average CSI-RS RE energy  average CSI-RS RE energy  EGG bundle size  REG bundle size						
Spacing			Config 1, 2		120 KHz	
PRACH Configuration  SSB index assigned as BFD RS (q <sub>0</sub> )  SSB index assigned as CBD RS (q <sub>1</sub> )  TCI Configuration  Config 1, 2  TBD  Configuration  OCNG parameters  OP.1  CP length Normal  Correlation Matrix and Antenna Configuration  DCI format Number of Control OFDM symbols 4 Aggregation level e e detection average CSI-RS RE energy missi on para meters S  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size  REG bundle size						
SSB index assigned as BFD RS (q0)	spacing	spacing				
SSB index assigned as BFD RS (q0)	DDACL	DDACH Config 1 2			Table A 3 8 3 4	
SSB index assigned as BFD RS (q0)					Table A.3.0.3.4	
SSB index assigned as CBD   TSSB index assigned as CBD   RS (q1)	Comige	Comiguration				
SSB index assigned as CBD	SSB inc	SSB index assigned as BFD RS			0	
TCI	(q <sub>0</sub> )					
TCI	000	de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la	I ODD			
TCI Configuration  OCNG parameters  CP length Correlation Matrix and Antenna Configuration  DCI format Number of Control OFDM symbols failur e Ratio of hypothetical detect cition smissi on para meter s  DMRS precoder granularity REG bundle size  TBD  TBD  TBD  TBD  TBD  TBD  TBD  TB			ned as CBD		1	
OCNG parameters  CP length  Correlation Matrix and Antenna Configuration  Beam failur e detection trans missi on para meters  S  DMRS precoder granularity  PCP length  Normal  OP.1  Normal  2x2 Low  Correlation Matrix and Antenna 2x2 Low  CCE  8  Ratio Of Control OFDM symbols  CCE  8  Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  To average CSI-RS RE energy  To average CSI-RS RE energy  To Ambient Matrix and Antenna  To DOP.1  Anterior Matrix and Antenna  Correlation Matrix and Antenna  To DCI format  Number of Control OFDM symbols  Aggregation level CCE  8  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  To Ambient Matrix and Antenna  To DCI format  Number of Control OFDM symbols  Aggregation level	KS (q1)					
OCNG parameters  CP length  Correlation Matrix and Antenna Configuration  Beam failur e detection trans missi on para meters  S  DMRS precoder granularity  PCP length  Normal  OP.1  Normal  2x2 Low  Correlation Matrix and Antenna 2x2 Low  CCE  8  Ratio Of Control OFDM symbols  CCE  8  Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  To average CSI-RS RE energy  To average CSI-RS RE energy  To Ambient Matrix and Antenna  To DOP.1  Anterior Matrix and Antenna  Correlation Matrix and Antenna  To DCI format  Number of Control OFDM symbols  Aggregation level CCE  8  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  To Ambient Matrix and Antenna  To DCI format  Number of Control OFDM symbols  Aggregation level	TCI		Config 1, 2		TBD	
OCNG parameters  CP length  Correlation Matrix and Antenna Configuration  DCI format Number of Control OFDM symbols failur e detection trans missi on para meters S  DMRS precoder granularity REG bundle size  OP.1  Normal  OP.1  Normal  2x2 Low  CCE 8  0 40  0 OFDM Symbols  CCE 8  0 O  0 OFDM Symbols  Aggregation level CCE 8  0 O  0 O  0 O  0 O  0 O  0 O  0 O  0		ıration	00g ., _			
CP length Correlation Matrix and Antenna Configuration  DCI format Number of Control OFDM symbols failur e Ratio of hypothetical on para meter S  PDCH DMRS energy to average CSI-RS RE energy DMRS precoder granularity REG bundle size  Normal  2x2 Low  1-0  0FDM 92	J					
Correlation Matrix and Antenna Configuration    DCI format	OCNG	paramete	ers			
Configuration    DCI format						
Beam failur e Aggregation level CCE 8 Ratio of hypothetical contrans missi on para meter S DCCH DMRS energy to average CSI-RS RE energy  DCI format 1-0  Number of Control 2  CCE 8  Ratio of hypothetical dB 0  PDCCH RE energy to average CSI-RS RE energy to average CSI-RS RE energy to average CSI-RS RE energy to average CSI-RS RE energy to average CSI-RS RE energy TMRS precoder granularity REG bundle size 6			x and Antenna		2x2 Low	
Beam failur e Ratio of hypothetical detection trans missi on para meter s   Mumber of Control 2 OFDM symbols  Aggregation level CCE 8 Ratio of hypothetical dB 0 PDCCH RE energy to average CSI-RS RE energy Ratio of hypothetical dB 0 PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size 6	Configu					
Beam failur e Aggregation level CCE 8 Ratio of hypothetical dB DCCH RE energy to average CSI-RS RE energy Ratio of hypothetical pDCCH DMRS energy to average CSI-RS RE energy To average CSI-RS RE ene						
failur e detec tion trans missi on para meter S	Boom				2	
e detec tion trans missi on para meter S				CCE	0	
detec tion trans missi on para meter s  Note that the process of t						
tion trans average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  S  REG bundle size  REG bundle size  REG bundle size  REG bundle size					U	
trans missi on para meter S						
missi on para meter s  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity  REG bundle size 6						
on para meter s  S  PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity  REG bundle size 6	missi			dВ	0	
to average CSI-RS RE energy  DMRS precoder granularity  REG bundle size 6	on	PDCCH DMRS energy		QD	Ŭ	
meter energy DMRS precoder granularity REG bundle size 6		to avera	ige CSI-RS RE			
DMRS precoder granularity  REG bundle size 6			-			
granularity  REG bundle size 6	S		orecoder		REG bundle size	
REG bundle size 6		granulai	rity			
DRX OFF						
· · · · · · · · · · · · · · · · · · ·	DRX				OFF	

Gap pattern ID			gp0	
rlmInSyncOutOfSync <sup>-</sup>	Threshold		absent	When the field is
				absent, the UE
				applies the value
				0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	[-94.5]	Threshold used
				for Q <sub>out_LR_SSB</sub>
powerControlOffsetSS	S		db0	Used for deriving
				rsrp-
				ThresholdCSI-RS
beamFailureInstanceI	MaxCount		n2	see clause 5.17
				of TS 38.321 [7]
beamFailureDetection	nTimer		pbfd4	see clause 5.17
				of TS 38.321 [7]
CSI-RS	Config		[CSI-RS.3.3 TDD]	
configuration	1, 2			
TCI states			[TCI.State.0]	
CSI-RS for tracking	Config 1, 2		[TRS.2.1 TDD]	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	0.4	
T3		S	[0.6]	
T4		S	[0.4]	
T5		S	[1.4]	
D1		S	[0.44]	
			to the UE prior to the start of time mitted after T1 starts.	period T1.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.7.5.5.1.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Pa	rameter	Unit	Test 1					Test 1				
				S	SB of se	et qo			SS	B of set	<b>q</b> 1	
			T1	T2	T3	T4	T5	T1	T2	Т3	T4	T5
EPRE ratio DMRS to S	of PDCCH SSS	dB										
EPRE ratio	of PDCCH to MRS	dB										
EPRE ratio to SSS	of PBCH DMRS	dB										
EPRE ratio	EPRE ratio of PBCH to				0					0		
	of PSS to SSS	dB			ŭ					ŭ		
EPRE ratio	of PDSCH	dB										
	of PDSCH to	dB										
EPRE ratio to SSS	of OCNG DMRS	dB										
SNR	Config 1, 2	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
$N_{oc}$	Config 1, 2	dBm/1 5KHz			[-98]					[-98]		
Propagatio	n condition			7	TDLA30-	·75		TDLA30-75				
Note 1.	ad accab th	0+ +b 0 ×		- i- C-II	4 4	l II					441	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.7.5.5.1.1-4: Measurement gap configuration for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Field	Test 2
rieiu	Value
gapOffset	0

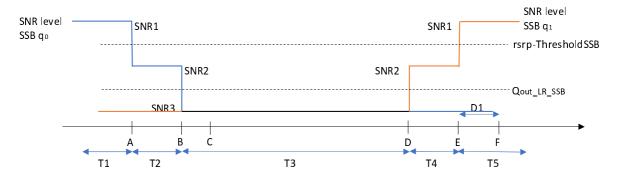


Figure A.7.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.7.5.5.1.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.5.5.2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode

Editor's note: It is open whether BFD can be based on SSB. This test case will be updated accordingly.

#### A.7.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.2.1-1, A.7.5.5.2.1-2, A.7.5.5.2.1-3, A.7.5.5.2.1-4 and A.7.5.5.2.1-5 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.2.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing

alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.7.5.5.2.1-1: Supported test configurations for FR2 PCell

Configuration	Description				
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth				
2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth				
Note: The UE is only required to pass in one of the supported test configurations in FR2					

Table A.7.5.5.2.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment	
				Test 1	
Active PCell				Cell 1	
RF Channel N	lumber			1	
Duplex mode		Config 1, 2		TDD	
BW <sub>channel</sub>		Config 1, 2		100: $N_{RB,c} = 66$	
DL initial BWF	)	Config 1, 2		DLBWP.0.1	
configuration					
DL dedicated	BWP	Config 1, 2		DLBWP.1.1	
configuration					
UL initial BWF	)	Config 1, 2		ULBWP.0.1	
configuration	D) 1 / D	0 " 1 0		111 514 5 4 4	
UL dedicated	BWP	Config 1, 2		ULBWP.1.1	
configuration		0 " 1 0		TDD0 (0.4	
TDD Configur		Config 1, 2		TDDConf.3.1	
CORESET Re	eterence	Config 1		CR. 3.1 TDD	
Channel	- C	Config 1, 2		000 4 500	
SSB Configur	SSB Configuration (			SSB.1 FR2	
SMTC Configuration Con		Config 1, 2		SMTC.1	
PDSCH/PDC0	CH	Config 1, 2		120 KHz	
subcarrier spa	cing				
PRACH Confi	guration	Config 1, 2		Table A.3.8.3.4	
SSB index as	signed as l	BFD RS (q <sub>0</sub> )		0	
SSB index as	signed as	CBD RS (q <sub>1</sub> )		1	
TCI Configura	tion	Config 1, 2		TBD	
OCNG param	eters	l		OP.1	
CP length				Normal	
Correlation Ma	atrix and A	ntenna		2x2 Low	
Configuration					
Beam failure	Beam failure DCI format			1-0	
detection transmission	Number OFDM s	of Control vmbols		2	
parameters		Aggregation level		8	
,	Ratio of PDCCH	hypothetical RE energy to CSI-RS RE	dB	0	

PDCCH DMR to average C	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		0	
DMRS precod granularity	der		REG bundle size	
REG bundle s	size		6	
DRX			DRX.7	A.3.3.7
Gap pattern ID			gp0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	[-94.5]	Threshold used for Qout_LR_SSB
powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI- RS
beamFailureInstanceMaxCou	nt		n2	see clause 5.17 of TS 38.321 [7]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS configuration	Config 1, 2		[CSI-RS.3.3 TDD]	
TCI states	•		[TCI.State.0]	
CSI-RS for tracking	Config 1, 2		[TRS.2.1 TDD]	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	0.4	
T3		S	[0.6]	
T4		S	[0.4]	
T5		S	[1.4]	
D1		S	[0.44]	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.7.5.5.2.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter	Unit	Test 1							Test 1		
			SS	B of se	t q₀			SS	B of se	t q₁	
		T1	T2	T3	T4	T5	T1	T2	Т3	T4	T5
AoA setup			Setup 3	defined	in A.3.15			Setup 3	defined	in A.3.	5
EPRE ratio of PDCCH	dB										
DMRS to SSS											
EPRE ratio of PDCCH to	dB										
PDCCH DMRS											
EPRE ratio of PBCH	dB										
DMRS to SSS											
EPRE ratio of PBCH to	dB										
PBCH DMRS				0					0		
EPRE ratio of PSS to SSS	dB										
EPRE ratio of PDSCH	dB										
DMRS to SSS											
EPRE ratio of PDSCH to	dB										
PDSCH DMRS											
EPRE ratio of OCNG	dB										
DMRS to SSS											
SNR Config 1, 2	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
$N_{oc}$ Config 1, 2	dBm/1			[-98]					[-98]		
- · oc	5KHz										
Propagation condition			T	DLA30-	75			T	DLA30-	75	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.2.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.7.5.5.2.1-4: Measurement gap configuration for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Field	Test 2
Field	Value
gapOffset	0

#### Table A.7.5.5.2.1-5: Void

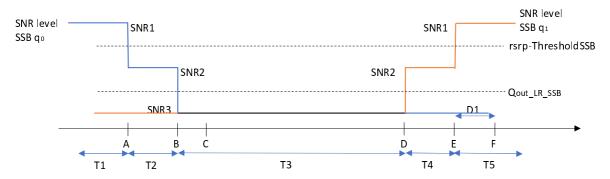


Figure A.7.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.7.5.5.2.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.5.3 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.7.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.3.1-1, A.7.5.5.3.1-2, and A.7.5.5.3.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.7.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.7.5.5.3.1-1: Supported test configurations for FR2 PCell

Configuration	Description					
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth					

Table A.7.5.5.3.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Pa	arameter	Unit	Value	Comment
		0	Test 1	
Active PCell			Cell 1	
RF Channel Nu	Config 1		1 TDD	
Duplex mode	Coning i		100	
TDD	Config 1		TDDConf.3.1	
Configuration				
CORESET	Config 1		CR.3.1 TDD	A.3.1.2
Reference				
Channel SSB	Config 1		SSB.1 FR2	A.3.10
Configuration	Coning 1		33D.1 FK2	A.3.10
SMTC	Config 1		SMTC.1	A.3.11
Configuration	Coming 1		OWITO.T	7
PDSCH/PDC	Config 1		120KHz	
CH subcarrier	J			
spacing				
csi-RS-Index as	signed as beam		[0]	
failure detection				
TRS configuration			TRS.2.1 TDD	
TCI configuration			CSI-RS.Config.0	1001
OCNG paramet	ers		OP.1	A.3.2.1
CP length Correlation Mat	riv and Antonna		Normal 2x2 Low	
Configuration	nx and Antenna		ZXZ LOW	
Configuration	DCI format		1-0	
	Number of Control		2	
Beam failure	OFDM symbols		_	
detection	Aggregation level	CCE	8	
transmission	Ratio of hypothetical	dB	0	
parameters	PDCCH RE energy			
	to average CSI-RS			
	RE energy			
	Ratio of hypothetical	dB	0	
	PDCCH DMRS			
	energy to average CSI-RS RE energy			
	DMRS precoder		REG bundle size	
	granularity		REG bullate size	
	REG bundle size		6	
DRX	. 120 20.10.0 0.20		OFF	
Gap pattern ID			N.A.	
csi-RS-Index as	signed as candidate		1	
beam detection				
rlmInSyncOutOf	fSyncThreshold		absent	When the field is
				absent, the UE
				applies the value
rsrp-ThresholdSSB		dBm	[-94.5]	0. (Table 8.1.1-1). Threshold used
151p-1111estiol055b		ubili	[-84.5]	for Q <sub>in_LR_SSB</sub>
powerControlOf	powerControlOffsetSS		NA	Used for deriving
				rsrp-
		<u> </u>		ThresholdCSI-RS
beamFailureIns	tanceMaxCount		[n2]	see clause 5.17
				of TS 38.321 [7]
beamFailureDe	tectionTimer		[pbfd4]	see clause 5.17
				of TS 38.321 [7]

CSI-RS configuration	Config 1		CSI-RS.3.2 TDD	A.3.14.2
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	0.4	
T3		s	[0.6]	
T4		S	[0.4]	
T5		s	[1.4]	
D1		S	[0.24]	
Note 1: UE-s	pecific PDCCH is not tra	nsmitted aft	ter T1 starts.	

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.7.5.5.3.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Para	ameter	Unit			Test 1			Test 1				
			CSI-RS of set q₀					CSI	-RS of se	et q <sub>1</sub>		
			T1	T2	Т3	T4	T5	T1	T2	Т3	T4	T5
EPRE ra	tio of PSS	dB										
to SSS												
	tio of PBCH	dB										
DMRS to												
	tio of PBCH	dB			0					0		
to PBCH		in.										
EPRE ra		dB										
PDCCH I SSS	DIVIRS TO											
EPRE ra	tio of	dB										
	to PDCCH											
DMRS												
EPRE ra		dB										
PDSCH I SSS	DMRS to											
EPRE ra	tio of	dB										
	to PDSCH	ub										
DMRS	01 00011											
	tio of OCNG	dB										
	SSS <sup>(Note 1)</sup>											
EPRE ra	tio of OCNG	dB										
	DMRS (Note											
1)	T			1	1		1			1 1		
SNR_C	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
SI-RS	Config 2		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
	Config 3		[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
$N_{oc}$	Config 1	dBm/			[-98]					[-98]		
OC.	Config 2	15K			[-98]					[-98]		
	Config 3	Hz		ree	[-98]	-1				[-98]	-1	
Propagat				[Т	DLA30-7	5]			ĮΤ	DLA30-7	5]	
condition												

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.7.5.5.3.1-4: Void Table A.7.5.5.3.1-5: Void

SNR level | SNR1 | SNR1 | CSI-RS q1 | CSI-RS q1 | CSI-RS q2 | | SNR2 | SNR2 | SNR2 | Qout\_LR\_CSI-RS | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2 | SNR2

Figure A.7.5.5.3.1-1: SNR variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

#### A.7.5.5.3.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.5.4 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.7.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.4.1-1, A.7.5.5.4.1-2, A.7.5.5.4.1-3, and A.7.5.5.4.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.4.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.7.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.7.5.5.4.1-1: Supported test configurations for FR2 PCell

Configuration	Description				
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth				

Table A.4.5.1.1.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

	Parameter	Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Nu	mher		1	
Duplex mode	Config 1		TDD	
TDD	Config 1		TDDConf.3.1	
Configuration				
CORESET	Config 1		CR.3.1 TDD	A.3.1.2
Reference Channel				
SSB	Config 1		SSB.1 FR2	A.3.10
Configuration	Coming 1		OOD.TTRE	71.5.10
SMTC	Config 1		SMTC.1	A.3.11
Configuration	J J			
PDSCH/PDC	Config 1		120 KHz	
CH subcarrier				
spacing			F01	
csi-RS-Index as detection RS in	ssigned as beam failure		[0]	
TRS configurati			TRS.2.1 TDD	
TCI configuration			CSI-RS.Config.0	
OCNG paramet			OP.1	A.3.2.1
CP length	010		Normal	71.0.2.1
Correlation Mat	rix and Antenna		2x2 Low	
Configuration				
	DCI format		1-0	
	Number of Control		2	
Beam failure	OFDM symbols	205		
detection transmission	Aggregation level	CCE	8	
parameters	Ratio of hypothetical PDCCH RE energy to	dB	0	
paramotoro	average CSI-RS RE			
	energy			
	Ratio of hypothetical	dB	0	
	PDCCH DMRS energy		-	
	to average CSI-RS RE			
	energy			
	DMRS precoder		REG bundle size	
	granularity			
DDV	REG bundle size		6	4007
DRX Con nottorn ID			DRX.7 *[ <i>gp0</i> ]	A.3.3.7
Gap pattern ID	signed as candidate		[ <i>gpo</i> ]	
beam detection			1	
rlmlnSyncOutO			absent	When the field is
	• · · · · · · · · · · · · · · · · · · ·			absent, the UE
				applies the value
		ļ		0. (Table 8.1.1-1).
rsrp-ThresholdS	SSB	dBm	-94.5	Threshold used
powerControlOf	footSS		NA	for Q <sub>in_LR_SSB</sub> Used for deriving
PowerControlOl	190199		INA	rsrp-
				ThresholdCSI-RS
beamFailureIns	tanceMaxCount		[n2]	see clause 5.17
				of TS 38.321 [7]
beamFailureDe	tectionTimer		[pbfd4]	see clause 5.17
				of TS 38.321 [7]

CSI-RS configuratio	Config 1		CSI-RS.3.2 TDD	A.3.14.2
T1		s	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	0.4	
T3		S	[0.6]	
T4		S	[0.4]	
T5		S	[1.4]	
D1		S	[0.44]	
Note 1: L	JE-specific PDCCH is no	ot transmitted after	T1 starts.	•

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.7.5.5.4.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Para	ameter	Unit			Test 1			Test 1				
				CSI	-RS of se	et qo			CSI	-RS of se	et q <sub>1</sub>	
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
EPRE ra	tio of PSS	dB										
to SSS												
	tio of PBCH	dB										
DMRS to												
	tio of PBCH	dB			0					0		
to PBCH												
EPRE ra		dB										
PDCCH	DMRS to											
SSS EPRE ra	tio of	dB										
	to PDCCH	uв										
DMRS	IO P DOCIT											
EPRE ra	tio of	dB										
PDSCH		u D										
SSS												
EPRE ra	tio of	dB										
PDSCH t	to PDSCH											
DMRS												
	tio of OCNG	dB										
	SSS <sup>(Note 1)</sup>											
	tio of OCNG	dB										
to OCNG	DMRS (Note											
SNR_C	Config 1	dB	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
SI-RS	Config 2	ub	[5]	[-3]	[-12]	[-12]	[-12]	[-12]	[-12]	[-12]	[-3]	[10]
31 10		}										
	Config 3 Config 1	dBm/	[5]	[-3]	[-12] [-98]	[-12]	[-12]	[-12]	[-12]	[-12] [-98]	[-3]	[10]
$N_{oc}$	Config 2	15K			[-96] [-98]					[-96] [-98]		
	Config 3	Hz			[-96] [-98]					[-96] [-98]		
Propagat		. 12		П	DLA30-7	51			ГТ	DLA30-7	51	
condition				יו	DL/ 100-1	~1			יו	DL/ (00-1	~ <u>1</u>	
20								1				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.7.5.5.4.1-4: Measurement gap configuration for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Field	Test 1
Field	Value
gapOffset	[0]

Table A.7.5.5.4.1-5: Void

Table A.7.5.5.4.1-6: Void



Figure A.7.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.7.5.5.4.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [TBD] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ .

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.5.6 Active BWP switch delay

#### A.7.5.6.1 DCI-based and Timer-based Active BWP Switch

### A.7.5.6.1.1 NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA

#### A.7.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.1.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2) as given in Table A.7.5.6.1.1.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.1.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.1.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

UE is configured with 2 different UE-specific bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

UE is configured with a bwp-InactivityTimer timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than at PCell's slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PCell's BWP-2 no later than slot  $(i+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

#### During T3,

The time period T3 starts from the slot #j immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than PCell's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 no later than slot  $(j+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

Table A.7.5.6.1.1.1-1: DL BWP switch supported test configurations

Config Description					
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode				
Note 1: The UE is only required to be tested in one of the supported test configurations					

Table A.7.5.6.1.1.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		2	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μs	3	Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.
T1	S	0.2	
T2	S	0.2	
T3	S	0.2	

Table A7.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parameter	Unit	Cell 1	Cell2		
Frequency Range		FR2	FR2		
Duplex mode		TDD			
TDD configuration		TDDConf.3.1			
BWchannel		100 MH	z: N <sub>RB,c</sub> = 66		
Active BWP ID		1, 2	3		
Downlink initial BWP Configuration		DLE	3WP.0.2		
Uplink initial BWP Configuration			BWP.0.2		
Downlink active BWP-1 Configuration		DLBWP.1.3	-		
Downlink active BWP-2 Configuration		DLBWP.1.3	-		
Uplink active BWP-1 Configuration		ULBWP.1.3	-		
Uplink active BWP-2 Configuration		ULBWP.1.3	-		
PDSCH Reference measurement channel		SR.	3.1 TDD		
TRS configuration		TRS	.2.1 TDD		
TCI state		TCI.State.0			
RMSI CORESET parameters		CR.3.1 TDD			
Dedicated CORESET parameters					
		CCR	.3.1 TDD		
OCNG Patterns		(	OP.1		
SSB Configuration		SSI	3.1 FR2		
SMTC Configuration		SI	MTC.1		
Correlation Matrix and Antenna		1x	2 Low		
Configuration					
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS	dB	0	0		
EPRE ratio of PDSCH to PDSCH	uВ	l 0	U		
EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
Propagation Condition		AWGN	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table A.7.5.6.1.1.1-4: OTA related test parameters for BWP switching test caseParameter	Unit	Cell 1	Cell 2					
Angle of arrival configuration		Setup 1 defined in clause A.3.15.1	Setup 1 defined in clause A.3.15.1					
$N_{oc}^{$	dBm/15kHz	TBD	TBD					
$N_{oc}^{}$ Note1	dBm/SCS	TBD	TBD					
SS-RSRP <sup>Note2</sup>	dBm/SCS Note3	TBD	TBD					
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	TBD	TBD					
Ês/Noc	dB	TBD	TBD					
Io <sup>Note4</sup>	dBm/95.04 MHz <sup>Note4</sup>	TBD	TBD					
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.  Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.								

#### A.7.5.6.1.1.2 Test Requirements

Note 4:

Note 5:

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+kI)$ .

As observed with 0 dBi gain antenna at the centre of the quiet zone.

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability bwp-SwitchingDelay [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot (i+YI), (j+Y2), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.7.5.6.1.2 NR FR1- NR FR2 DL active BWP switch of PCell with non-DRX in SA

#### A.7.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.2.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). The general parameters are given in Table A.7.5.6.1.2.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.2.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

UE is configured with 2 different UE-specific bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

UE is configured with a bwp-InactivityTimer timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than at PCell's slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PCell's BWP-2 no later than slot  $(i+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

## During T3,

The time period T3 starts from the slot #j immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than PCell's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 no later than slot  $(j+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

Table A.7.5.6.1.2.1-1: DL BWP switch supported test configurations

	Config	Description
1		PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
		SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
		SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3		PCell: NR 30 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
		SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.7.5.6.1.2.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		2	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	ub	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	ab	Ŭ	
Cell2 timing offset to cell1	μs	3	Time alignment error as specified in TS
	μο	3	38.104 [13] clause 6.5.3.1.
T1	s	0.2	
T2	S	0.2	
T3	S	0.2	

Table A6.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA

Para	meter	Unit	Cell 1	Cell2
Frequency Range			FR1	FR2
Duplex mode	Config 1		FDD	TDD
	Config 2,3		TDD	TDD
TDD configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	TDDConf.3.1
	Config 3		TDDConf.2.1	
BW <sub>channel</sub>	Config 1,2	MHz	10 MHz: N <sub>RB,c</sub> = 52	400 MH I NI CC
	Config 3		40 MHz: N <sub>RB,c</sub> = 106	100 MHz: N <sub>RB,c</sub> = 66
Active BWP ID			1, 2	3
Downlink initial BWP	Configuration		DLBV	
Uplink initial BWP Co	nfiguration		ULBV	/P.0.2
Downlink active BWF	P-1 Configuration		DLBWP.1.3	-
Downlink active BWI	P-2 Configuration		DLBWP.1.3	-
Uplink active BWP-1	Configuration		DLBWP.1.3	-
Uplink active BWP-2	Configuration		DLBWP.1.3	-
PDSCH Reference	Config 1		SR.1.1 FDD	SR.3.1 TDD
measurement	Config 2		SR.1.1 TDD	
channel	Config 3	İ	SR.2.1 TDD	
RMSI CORESET	Config 1		CR.1.1 FDD	
parameters	Config 2		CR.1.1 TDD	CR.3.1 TDD
	Config 3		CR.2.1 TDD	
Dedicated	Config 1		CCR.1.1 FDD	
CORESET	Config 2		CCR.1.1 TDD	CCR.3.1 TDD
parameters	Config 3		CCR.2.1 TDD	
OCNG Patterns			OF	
SSB Configuration	Config 1,2		SSB.1 FR1	SSB.1 FR2
	Config 3		SSB.2 FR1	
TRS configuration	Config 1,2,3		-	TRS.2.1 TDD
TCI state	Config 1,2,3		TCI.State.0	TCI.State.0
SMTC Configuration			SM	
Correlation Matrix an	d Antenna		1x2	Low
Configuration	000			
EPRE ratio of PSS to				
EPRE ratio of PBCH				
EPRE ratio of PBCH to PBCH DMRS		1		
EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS		<del> </del>		
EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS		dB	0	0
EPRE ratio of PDSCH to PDSCH		ub	U	U
EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note		ł l		
1)				
EPRE ratio of OCNG	to OCNG DMRS	†		
(Note 1)	to SOITO DIVINO			
Propagation Conditio	n		AWGN	AWGN
		·		<u> </u>

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Table A.7.5.6.1.2.1-4: OTA related test parameters for BWP switching test case

Parameter	Unit	Cell 1	Cell 2
Angle of arrival configuration		Setup 1 defined in clause A.3.15.1	Setup 1 defined in clause A.3.15.1
$N_{oc}^{}$ Note1	dBm/15kHz	TBD	TBD
$N_{oc}^{}$ Note1	dBm/SCS	TBD	TBD
SS-RSRP <sup>Note2</sup>	dBm/SCS Note3	TBD	TBD
$\hat{E}_{s}/I_{ot}$	dB	TBD	TBD
Ê <sub>s</sub> /N <sub>oc</sub>	dB	TBD	TBD
lo <sup>Note4</sup>	dBm/95.04 MHz <sup>Note4</sup>	TBD	TBD

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

#### A.7.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in a slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for PSCell in a slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability bwp-SwitchingDelay [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot (i+YI), (j+Y2), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.7.5.6.1.3 NR FR2 DL active BWP switch with non-DRX in SA

#### A.7.5.6.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.7.5.6.1.3.1-1.

The test scenario comprises of one NR cell (Cell 1) as given in Table A.7.5.6.1.3.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.6.1.3.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.6.1.3.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell 1's slot # denoted *i*. The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at Cell 1's slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 no later than at slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell 1's BWP-2 starting from slot  $(i+T_{BWPswitchDelay})$ .

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell 1.

#### During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at Cell 1's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 at latest at slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell 1's BWP-1 starting from slot  $(j+T_{BWPswitchDelay})$ .

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

Table A.7.5.6.1.3.1-1: DL BWP switch supported test configurations

Config		Description	
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
Note 1:	e 1: The UE is only required to be tested in one of the supported test configurations		
Note 2:	ote 2: A UE which fulfils the requirements in test case A.7.5.6.1.1 or A.7.5.6.1.2 can skip the test cases in		
	A.7.5.6.1.3.		

Table A.7.5.6.1.3.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell on RF channel number 1.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A7.5.6.1.3.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parameter	Unit	Cell 1
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66
Active BWP ID		1, 2
Initial DL BWP Configuration		DLBWP.0.2 Note 2
Active DL BWP-1 Configuration		DLBWP.1.1 Note 2
Active DL BWP-2 Configuration		DLBWP.1.3 Note 2
Initial UL BWP Configuration		ULBWP.0.2 Note 2
Active UL BWP-1 Configuration		ULBWP.1.1 Note 2
Active UL BWP-2 Configuration		ULBWP.1.3 Note 2
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State		TCI.State.0
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna		1x2 Low
Configuration		
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS	]	
EPRE ratio of PDSCH to PDSCH	]	
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note		
1)		
Propagation Condition		AWGN

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

Table A7.5.6.1.3.1-4: OTA related test parameters for DL BWP switch in SA

	Parameter	Unit	Cell 2	
Angle of arrival configuration			Setup 1 defined in	
			clause A.3.15.1	
N <sub>oc</sub> Note 1		dBm/15	TBD	
		kHz		
N <sub>oc</sub> Note 1		dBm/SCS	TBD	
SS-RSF	RP Note 2	dBm/120	TBD	
		kHz Note3		
Ês/Iot		dB	TBD	
Io <sup>Note2</sup>		dBm/95.04	TBD	
		MHz Note4		
Note 1:	Interference from other cells and r			
	assumed to be constant over sub-	carriers and tim	ne and shall be modelled as	
	AWGN of appropriate power for N			
Note 2:	SS-RSRP and lo levels have beer		•	
	information purposes. They are no	•		
Note 3:	SS-RSRP minimum requirements	•	9 .	
	interference and noise at each rec			
Note 4:	Equivalent power received by an a	antenna with 0	dBi gain at the centre of the	
=	quiet zone			
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.				

#### A.7.5.6.1.3.2 Test Requirements

During T1, the UE shall start to send the ACK for Cell 1 in a slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for Cell 1 in a slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability bwp-SwitchingDelay [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in a slot  $(i + T_{BWPswitchDelay} + kI)$ ,  $(j + T_{BWPswitchDelay} + kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

### A.7.5.6.2 RRC-based Active BWP Switch

#### A.7.5.6.2.1 NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA

#### A.7.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.7.5.6.2.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.7.5.6.2.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.7.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

#### During T1,

Time period T1 starts when a *RRCReconfiguration* with bandwidth part configuration BWP-2, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at PCell's slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PCell no later than at slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ). The UE shall be continuously scheduled on PCell's BWP-2 starting from slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ).

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PCell by counting the time from the time when the RRC Reconfiguration message including BWP switch command is sent till the time when RRC Reconfiguration Complete message is received.

Table A.7.5.6.2.1.1-1: DL BWP switch supported test configurations

Config		Description
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only	required to be tested in one of the supported test configurations

Table A.7.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
T1	S	[0.2]	

[3].

Table A.7.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

	Parameter	Unit	Cell 1	
Frequency F	Frequency Range		FR2	
Duplex mode			TDD	
TDD configu			TDDConf.3.1	
BW <sub>channel</sub>			100 MHz: N <sub>RB,c</sub> = 66	
Active BWP	ID		1, 2	
Initial DL BV	VP Configuration		DLBWP.0.2	
Active DL BWP-1 Configuration			DLBWP.1.3	
Active DL B	WP-2 Configuration		DLBWP.1.1	
Initial UL BV	VP Configuration		ULBWP.0.2	
Active UL B	WP-1 Configuration		NA	
	WP-2 Configuration		ULBWP.1.3	
'PDSCH Re	ference measurement channel		SR.3.1 TDD	
RMSI CORE	SET parameters		CR.3.1 TDD	
Dedicated C	ORESET parameters		CCR.3.1 TDD	
OCNG Patte	erns		OP.1	
SSB Configu	uration		SSB.1 FR2	
SMTC Conf	guration		SMTC.1	
TCI State			TCI.State.0	
TRS Configu	uration		TRS.2.1 TDD	
Antenna Co			1x2	
Propagation			AWGN	
EPRE ratio of		dB	0	
	PBCH DMRS to SSS			
	PBCH to PBCH DMRS			
	PDCCH DMRS to SSS PDCCH to PDCCH DMRS			
	PDSCH DMRS to SSS			
	PDSCH to PDSCH			
	OCNG DMRS to SSS(Note 1)			
	OCNG to OCNG DMRS (Note 1)			
Note 1: C	CNG shall be used such that bot	h cells are full	y allocated and a constant	
to	total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: Ir	Interference from other cells and noise sources not specified in the test is			
	ssumed to be constant over subc			
	as AWGN of appropriate power for $N_{oc}$ to be fulfilled.			
	information purposes. They are not settable parameters themselves.			
Note 4: F	For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2			

Table A.7.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213

Para	meter	Unit	Cell 2
Angle of arrival config	guration		According to table A.3.15
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
N oc Note1	NR_TDD_FR2_F	dBm/15kHz	TBD
	NR_TDD_FR2_G	- abiii/ioknz	IBU
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
	NR_TDD_FR2_A		
N Note1	NR_TDD_FR2_B		TBD
IV oc	NR_TDD_FR2_F	dBm/SCS	
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		

		NR_TDD_FR2_Y				
SS-RSRP <sup>Note2</sup>		NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T	dBm/SCS Note3	TBD		
		NR_TDD_FR2_Y	dB			
$E_{s}/I_{ot}$	$\hat{E}_{s}/I_{ot}$			TBD		
Io <sup>Note2</sup>		NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dBm/95.04 MHz <sup>Note4</sup>	TBD		
Note 1:	Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\rm ac}$ to be fulfilled.					
Note 2:			en derived from other parameters for not settable parameters themselves.			
Note 3: SS-RSRP minimum requirements interference and noise at each rec			s are specified assuming independent eceiver antenna port.			
Note 4:	Equivalent quiet zone	-	antenna with 0 c	dBi gain at the centre of the		

#### A.7.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell in a slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.6 Measurement procedure

## A.7.6.1 Intra-frequency Measurements

## A.7.6.1.1 SA event triggered reporting test without gap under non-DRX

## A.7.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.1.1-1.

Table A.7.6.1.1.1-1: supported test configurations

Configuration		Description
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		equired to be tested in one of the supported test configurations.

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.1.1-2, A.7.6.1.1.1-3 and A.7.6.1.1.1-4 below.

In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.7.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX

Parameter	Unit	Config	Value	Comment
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
SMTC configuration		1, 2	SMTC.1	
A3-Offset	dB	1, 2	-6	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
Time To Trigger	S	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and Cell 2		1, 2	3 μs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1, 2	3 μs	Synchronous cells
T1	S	1, 2	5	
T2	s	1, 2	5	

Table A.7.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX

Parameter	Unit	Config	Се	II 1	Ce	II 2
			T1	T2	T1	T2

TDD configuration		1, 2	TDDConf.3.1	TDDConf.3.1
Intial BWP		1, 2	DLBWP.0.1	DLBWP.0.1
configuration			ULBWP.0.1	ULBWP.0.1
Active DL BWP		1, 2	DLBWP.1.1	DLBWP.1.1
configuration				
Active UL BWP		1, 2	ULBWP.1.1	ULBWP.1.1
configuration				
RLM-RS		1, 2	SSB	SSB
PDSCH RMC		1, 2	SR.3.1 TDD	N/A
configuration				
RMSI CORESET		1, 2	CR.3.1 TDD	CR.3.1 TDD
RMC				
configuration				
Dedicated		1, 2	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC				
configuration				
TRS configuration		1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH		1, 2	TCI.State.2	N/A
TCI states				
OCNG Patterns		1, 2	OP.1	OP.1
SSB		1	SSB.1 FR2	SSB.1 FR2
		2	SSB.2 FR2	SSB.2 FR2
Propagation		1, 2	AWGN	
Condition				

Table A.7.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX

Parameter	Unit	Config	Ce	Cell 1		Cell 2	
			T1	T2	T1	T2	
AoA setup		1, 2	S	Setup 3 defined in A.3.15.3			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	TBD TBD TBD		TBD		
$N_{oc}$ Note 2	dBm/15 KHz	1, 2		T	BD		
Note 2	dBm/SCS	1	TBD				
1 voc		2		Т	BD		
SS-RSRP	dBm/SCS	1	TBD	TBD	TBD	TBD	
		<u>2</u>	TBD	TBD	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	1, 2	TBD	TBD	TBD	TBD	
Io	dBm/95.04MHz	1, 2	TI	TBD TBD			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.7.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2 or 3,
- [1.44s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.1.2 SA event triggered reporting test without gap under DRX

#### A.7.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.2.1-1.

Table A.7.6.1.2.1-1: supported test configurations

Configuration		Description				
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note:	The UE is only re	equired to be tested in one of the supported test configurations.				

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.2.1-2  $\sim$  6.

In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.7.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	

Active cell		1, 2	PCell (Ce	ell 1)	
Neighbour cell		1, 2	Cell 2		Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2		One TDD carrier frequency is used for the NR cells.
SMTC configuration		1, 2	SMTC.1		
A3-Offset	dB	1, 2	-6		
CP length		1, 2	Normal		
Hysteresis	dB	1, 2	0		
Time To Trigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	DRX.1	DRX.2	DRX related parameters are defined in
		1, 2			Table A.7.6.1.2.1-5
Time offset between Cell 1		1, 2	3 μs		Synchronous EN-DC
and Cell 2		1, 2			
Time offset between Cell 2		1, 2	3 μs		Synchronous cells
and Cell 3		1, 2			
T1	S	1, 2	5		
T2	S	1, 2	10	52	

Table A.7.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX

Parameter	Unit	Config	Cell 1	Cell 2
			T1 T2	T1 T2
TDD configuration		1, 2	TDDConf.3.1	TDDConf.3.1
Intial BWP		1, 2	DLBWP.0.1	DLBWP.0.1
configuration			ULBWP.0.1	ULBWP.0.1
Active DL BWP		1, 2	DLBWP.1.1	DLBWP.1.1
configuration				
Active UL BWP		1, 2	ULBWP.1.1	ULBWP.1.1
configuration				
RLM-RS		1, 2	SSB	SSB
PDSCH RMC		1, 2	SR.3.1 TDD	N/A
configuration				
RMSI CORESET		1, 2	CR.3.1 TDD	CR.3.1 TDD
RMC				
configuration				
Dedicated		1, 2	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC				
configuration				
TRS configuration		1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH		1, 2	TCI.State.2	N/A
TCI states				
OCNG Patterns		1, 2	OP.1	OP.1
SSB		1	SSB.1 FR2	SSB.1 FR2
		2	SSB.2 FR2	SSB.2 FR2
Propagation		1, 2		AWGN
Condition				

Table A.7.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX

Parameter	Unit	Config	Ce	II 1	Cell 2			
			T1	T2	T1	T2		
AoA setup		1, 2	S	etup 1 defii	ned in A.3.1	5.1		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	4	-1.46	-Infinity	-1.46		
$N_{oc}^{}$ Note 2	dBm/15 KHz	1, 2		-98				
Note 2	dBm/SCS	1		-89				
oc oc		2			-86			
SS-RSRP	dBm/SCS	1	-85	-85	-Infinity	-85		
		2	-82	-82	-Infinity	-82		
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4		
Io	dBm/95.04MHz	1	-54.56	-52.21	-54.56	-52.21		

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.7.6.1.2.1-5: Void

Table A.7.6.1.2.1-6: Void

### A.7.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2 or 3,
- [4.32s] for a UE supporting power class 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2 or 3,
- [30.72s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.1.3 SA event triggered reporting test with per-UE gaps under non-DRX

### A.7.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.3.1-1.

Table A.7.6.1.3.1-1: supported test configurations

	Configuration	Description				
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note:	e: The UE is only required to be tested in one of the supported test configurations.					

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.3.1-2 ~ 4 below.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.7.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter Unit Config Value		Value	Comment	
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
Gap type		1, 2	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2	40	
Measurement gap length	ms	1, 2	6	
Measurement gap offset	ms	1, 2	39	
SMTC configuration		1, 2	SMTC.1	
CSI-RS parameters		1, 2	CSI-RS.3.2 TDD	
A3-Offset	dB	1, 2	-6	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
Time To Trigger	S	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and Cell 2		1, 2	3 μs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1, 2	3 μs	Synchronous cells
T1	s	1, 2	5	
T2	S	1, 2	5	

Table A.7.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2

TDD configuration	1, 2	TDDConf.3.1	TDDConf.3.1
Intial BWP	1, 2	DLBWP.0.1	DLBWP.0.1
configuration		ULBWP.0.1	ULBWP.0.1
Active DL BWP	1, 2	DLBWP.1.2	DLBWP.1.1
configuration			
Active UL BWP	1, 2	ULBWP.1.2	ULBWP.1.1
configuration			
RLM-RS	1, 2	CSI-RS	SSB
PDSCH RMC	1, 2	SR.3.1 TDD	N/A
configuration			
RMSI CORESET	1, 2	CR.3.1 TDD	CR.3.1 TDD
RMC			
configuration			
Dedicated	1, 2	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC			
configuration			
TRS configuration	1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH	1, 2	TCI.State.2	N/A
TCI states			
OCNG Patterns	1, 2	OP.1	OP.1
SSB	1	SSB.1 FR2	SSB.1 FR2
	2	SSB.2 FR2	SSB.2 FR2
Propagation Condition	1, 2	AV	VGN

Table A.7.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Ce	ell 1	Ce	II 2		
			T1	T2	T1	T2		
AoA setup		1, 2	S	etup 3 defii	ned in A.3.1	5.3		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	TBD	TBD	TBD	TBD		
$N_{oc}$ Note 2	dBm/15 KHz	1, 2		TBD				
Note 2	dBm/SCS	1		TBD				
1 oc		2		T	BD			
SS-RSRP	dBm/SCS	1	TBD	TBD	TBD	TBD		
		<u>2</u>	TBD	TBD	TBD	TBD		
$\hat{E}_s/N_{oc}$	dB	1, 2	TBD	TBD	TBD	TBD		
Io	dBm/95.04MHz	1, 2	TI	BD	TE	3D		

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.7.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 1.92s for a UE supporting power class 2 or 3,
- [1.92s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.1.4 SA event triggered reporting test with per-UE gaps under DRX

### A.7.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.4.1-1.

Table A.7.6.1.4.1-1: supported test configurations

Cor	nfiguration	Description				
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.4.1-2, A.7.6.1.4.1-3 and A.7.6.1.4.1-4 below.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.7.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	

Active cell		1, 2	PCell (Cell	l 1)	
Neighbour cell		1, 2	Cell 2		Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 a	nd Cell 2	One TDD carrier frequency is used for the NR cells.
Gap type		1, 2	Per-UE ga	ıps	
Measurement gap repitition periodicity	ms	1, 2	40		
Measurement gap length	ms	1, 2	6		
Measurement gap offset	ms	1, 2	39		
SMTC configuration		1, 2	SMTC.1		
CSI-RS parameters		1, 2	CSI-RS.3.	2 TDD	
A3-Offset	dB	1, 2	-6		
CP length		1, 2	Normal		
Hysteresis	dB	1, 2	0		
Time To Trigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	DRX.1	DRX.2	DRX related parameters are defined in Table A.7.6.1.2.1-5
Time offset between Cell 1 and Cell 2		1, 2	3 μs		Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1, 2	3 μs		Synchronous cells
T1	S	1, 2	5		
T2	s	1, 2	10	52	

Table A.7.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Cell 1	Cell 2	
			T1 T2	T1 T2	
TDD configuration		1, 2	TDDConf.3.1	TDDConf.3.1	
Intial BWP		1, 2	DLBWP.0.1	DLBWP.0.1	
configuration			ULBWP.0.1	ULBWP.0.1	
Active DL BWP		1, 2	DLBWP.1.2	DLBWP.1.1	
configuration					
Active UL BWP		1, 2	ULBWP.1.2	ULBWP.1.1	
configuration					
RLM-RS		1, 2	SCSI-RS	SSB	
PDSCH RMC		1, 2	SR.3.1 TDD	N/A	
configuration					
RMSI CORESET		1, 2	CR.3.1 TDD	CR.3.1 TDD	
RMC					
configuration					
Dedicated		1, 2	CCR.3.1 TDD	CCR.3.1 TDD	
CORESET RMC					
configuration					
TRS configuration		1, 2	TRS.2.1 TDD	N/A	
TCI state		1, 2	CSI-RS.Config.0	) N/A	
OCNG Patterns		1, 2	OP.1	OP.1	
SSB		1	SSB.1 FR2	SSB.1 FR2	
		2	SSB.2 FR2	SSB.2 FR2	
Propagation		1, 2	AWGN		
Condition					

Table A.7.6.1.4.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX

Unit Config		Ce	II 1	Cell 2				
		T1	T2	T1	T2			
oA setup 1, 2 Setup 1 defined in A.3								
dB	1, 2	4	-1.46	-Infinity	-1.46			
dBm/15 KHz	1, 2		-98					
dBm/SCS	1	-89						
	2		-86					
dBm/SCS	1	-85	-85	-Infinity	-85			
	2	-82	-82	-Infinity	-82			
dB	1, 2	4	4	-Infinity	4			
dBm/95.04MHz	1	-54.56	-52.21	-54.56	-52.21			
	dB  dBm/15 KHz  dBm/SCS  dBm/SCS	dB 1, 2  dBm/15 KHz 1, 2  dBm/SCS 1  2  dBm/SCS 1  2  dBm/SCS 1  2  dB 1, 2	T1	T1   T2   Setup 1 defin	T1         T2         T1           1, 2         Setup 1 defined in A.3.1           dB         1, 2         4         -1.46         -Infinity           dBm/15 KHz         1, 2         -98           dBm/SCS         1         -89         -86           dBm/SCS         1         -85         -85         -Infinity           2         -82         -82         -Infinity           dB         1, 2         4         4         -Infinity			

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves

Table A.7.6.1.4.1-5: Void

Table A.7.6.1.4.1-6:Void

#### A.7.6.1.4.2 **Test Requirements**

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2 or 3,
- 4.32s for a UE supporting power class 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2 or 3,
- [30.72s] for a UE supporting power class 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2 Inter-frequency Measurements

## A.7.6.2.1 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2)

### A.7.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

n this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.1.1-1, A.7.6.2.1.1-2, and A.7.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.1.1-1.

Table A.7.6.2.1.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2

Conf	fig	Description
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: targ	get NR cell ha	s the same SCS, BW and duplex mode as NR serving cell

Table A.7.6.2.1.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6		
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	S	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	OFF		DRX is not used
Time offset between		Config 1	3µs		Synchronous cells.
serving and neighbour					
cells					
T1	S	Config 1	5		
T2	S	Config 1	5.2 for PC1; 3.5 for other PC		

Table A.7.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test	Ce	II 1	C	cell 1
		0	configuratio	T1	T2	T1	T2
			n				
NR RF Channe	NR RF Channel Number		Config 1		1		2
Duplex mode	Duplex mode		Config 1	T	DD	TDD	
TDD configura	tion		Config 1		onf.3.1		Conf.3.1
BW <sub>channel</sub>		MHz	Config 1		RB,c = 66		N <sub>RB,c</sub> = 66
BWP BW		MHz	Config 1	100: N	RB,c = 66	100: 1	N <sub>RB,c</sub> = 66
BWP	Initial DL			DLBV	/P.0.1		N/A
configuration	BWP		]				
	Initial UL			ULBV	VP.0.1		N/A
	BWP Dedicated DL		Config 1	DI DV	/P.1.1		N/A
	BWP			DLDV	VP.1.1		IN/A
	Dedicated UL		-				
	BWP			ULBV	/P.1.1		N/A
OCNG Pattern	s defined in		Config 1				
A.3.2.1.1 (OP.	1)			OF	P.1		)P.1
PDSCH Refere	ence		Confin 1	SR.3.	1 TDD		-
measurement			Config 1				
CORESET Ref	ference		Config 1	CR.3.	1 TDD		-
Channel			Oornig i				
SMTC configur			Config 1	SM	ΓC.1	SN	ATC.1
in A.3.11.1 and						5	
PDSCH/PDCC	H subcarrier	kHz	Config 1	12	20		120
TRS configuration	spacing		Config 1	TRS.2.1 TDD		N/A	
TCI configurati			Config 1 Config 1	CSI-RS.Config.0		N/A	
EPRE ratio of	PSS to SSS		Cornig i	001-100.	Cornig.0		IN/A
			-				
EPRE ratio of I to SSS	PBCH DMRS						
	PBCH to PBCH		-				
DMRS	i boirto i boir					0	
	PDCCH DMRS						
to SSS							
EPRE ratio of I	PDCCH to		1		_		
PDCCH DMRS			Config 1	(	)		
	PDSCH DMRS						
to SSS	DD00114		-				
EPRE ratio of I	PDSCH to						
PDSCH EPRE ratio of (	OCNG DMRS		-				
to SSS(Note 1)							
EPRE ratio of			1				
OCNG DMRS	(Note 1)						
UE orientation		degrees	Config 1	N	IA	-	ΓBD
axis and TBD a		ucgiees					
	ence in angle of		Config 1	N	IA	NA	TBD
arrival of cell 3	relative to cell	degrees					
	2			_0	28		<u> </u> -98
$N_{oc}$ Note2		dBm/15 kHz		-98			00
		Note5					
$N_{oc}$ Note2		dBm/S	Config 1	-89			-89
1 oc		CS	-				
		Note4	_		1	<u> </u>	T .
SS-RSRP Note 3	5	dBm/S	Config 1	-85	-85	-Infinity	-82
		CS NotoF					
		Note5					

$\hat{E}_{s}/I_{ot}$	dB	Config 1	4	4	-Infinity	7	
$\hat{E}_s/N_{oc}$	dB	Config 1	4	4	-Infinity	7	
Io <sup>Note3</sup>	dBm/95 .04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00	
Propagation Condition		Config 1	AWGN				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.6.2.1.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2.2 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is used (PCell in FR2)

### A.7.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

n this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.2.1-1, A.7.6.2.2.1-2, and A.7.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.2.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR2-FR2

	Config	Description
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	target NR cell ha	s the same SCS, BW and duplex mode as NR serving cell

Table A.7.6.2.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test		Va	lue		Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel Number		Config 1	1, 2			Two FR1 NR carrier frequencies is used.	
Active cell		Config 1	NR ce	II 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR ce	II 2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		39		
SMTC-SSB parameters		Config 1	SSB.3	FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Norma	al			
TimeToTrigger	S	Config 1	0				
Filter coefficient		Config 1	0				L3 filtering is not used
DRX		Config 1	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3µs				Synchronous cells.
T1	S	Config 1	5				
T2	S	Config 1	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 1		Cell 2		
		configuratio	T1	T2	T1	T2	
		n					
NR RF Channel Number		Config 1	1			2	
TDD configuration		Config 1	TDDConf.3.1		TDDConf.3.1		

Duplex mode			Config 1	TI	OD	1	TDD
BW <sub>channel</sub>		MHz	Config 1	100: N	RB,c = 66	100: N	√RB,c = 66
BWP BW		MHz	Config 1		RB,c = 66		√RB,c = 66
BWP configuration	Initial DL BWP				VP.0.1		N/A
	Initial UL BWP		Config 1	_	VP.0.1		N/A
	Dedicated DL BWP		Coning i	DLBV	VP.1.1		N/A
0010 5 #	Dedicated UL BWP		0 ( 1	ULBV	VP.1.1	1	N/A
OCNG Patterns A.3.2.1.1 (OP.1	)		Config 1		P.1	C	)P.1
PDSCH Refere			Config 1	SR.3.	1 TDD		-
measurement of							
CORESET Ref Channel			Config 1	CR.3.	1 TDD		-
SMTC configur in A.3.11.1 and	A.3.11.2		Config 1	SM	TC.1	SN	ITC.1
PDSCH/PDCC spacing	H subcarrier	kHz	Config 1	1.	20		120
TRS configurat			Config 1	TRS.2	.1 TDD		N/A
TCI configuration	on		Config 1	CSI-RS	.Config.0		V/A
EPRE ratio of F	PSS to SSS		_				
EPRE ratio of F to SSS							
EPRE ratio of F DMRS	PBCH to PBCH						
EPRE ratio of F to SSS	PDCCH DMRS						
EPRE ratio of F PDCCH DMRS			Config 1	0		0	
EPRE ratio of F to SSS	PDSCH DMRS						
EPRE ratio of F	PDSCH to						
EPRE ratio of 0 to SSS(Note 1)							
EPRE ratio of O	(Note 1)						
UE orientation axis and TBD a	ıxis	degrees	Config 1		IA		ΓBD
Relative differe arrival of cell 3 2		degrees	Config 1	N	IA	NA	TBD
$N_{oc}$ Note2		dBm/15 kHz		-98			-98
		Note5				1	
$N_{oc}^{ m Note2}$		dBm/S CS	Config 1	-89			-89
SS-RSRP Note 3		Note4 dBm/S CS Note5	Config 1	-85 -85		-Infinity	-82
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		dB	Config 1	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1	4	4	-Infinity	7

Io <sup>Note3</sup>		dBm/95	Config 1	-57.55	-57.55	-Infinity	-56.00
		.04	_				
		MHz					
		Note5					
Propagat	tion Condition		Config 1		A\	WGN	
Note 1:	OCNG shall be used	such that b	ooth cells are ful	ly allocated a	and a consta	nt total trans	mitted power
	spectral density is ac	hieved for	all OFDM symbo	ols.			
Note 2:	Interference from oth	er cells and	d noise sources	not specified	in the test is	s assumed to	be constant
	over subcarriers and	time and s	hall be modelled	l as AWGN c	of appropriate	e power for .	$N_{oc}$ to be
	fulfilled.						
Note 3:	SS-RSRP and lo leve	els have be	en derived from	other param	eters for info	ormation pur	poses. They
	are not settable para	meters thei	mselves.	•			•
Note 4:	SS-RSRP minimum i	requiremen	ts are specified	assuming ind	dependent ir	iterference a	nd noise at
	each receiver antenna port.						
Note 5:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone						
Note 6:	As observed with 0 dBi gain antenna at the centre of the quiet zone						

### A.7.6.2.2.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

1200 for UE supporting other power class. In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2.3 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is not used (PCell in FR2)

### A.7.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.3.1-1, A.7.6.2.3.1-2, and A.7.6.2.3.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.3.1-1.

Table A.7.6.2.3.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2

	Config	Description
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	target NR cell ha	as the same SCS, BW and duplex mode as NR serving cell

Table A.7.6.2.3.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Va	lue	Comment
		configurati	Test 1	Test 2	
		on			
NR RF Channel		Config 1	1, 2		Two FR1 NR carrier frequencies is
Number					used.
Active cell		Config 1	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel
		_			number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel
					number 2.
Gap Pattern Id		Config 1	0	13	As specified in clause 9.1.2-1.
Measurement gap		Config 1	39	39	·
offset					
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6		
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	S	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	OFF		DRX is not used
Time offset between		Config 1	3µs		Synchronous cells.
serving and neighbour			•		
cells					
T1	s	Config 1	5		
T2	s	Config 1	7 for PC1;	7 for PC1;	
			4.5 for other	4.5 for other	
			PC	PC	

Table A.7.6.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test	Cel	II 1	C	Cell 2		
			configuratio	T1	T2	T1	T2		
NR RF Channe	al Number		n Config 1	1			2		
			-	·		_			
Duplex mode	tion		Config 1	TDDC		TDDConf 2.4			
TDD configura	uon	MHz	Config 1 Config 1	TDDCc 100: N <sub>R</sub>		TDDConf.3.1 100: N <sub>RB,c</sub> = 66			
BWP BW		MHz	Config 1	100: NR			NRB,c = 66		
BWP	Initial DL	1411.12	Cornig i	DLBW			V/A		
configuration	BWP								
	Initial UL BWP		Config 1	ULBW	P.0.1		N/A		
	Dedicated DL BWP		Coning i	DLBW	P.1.1		N/A		
	Dedicated UL BWP			ULBW	P.1.1		N/A		
OCNG Pattern			Config 1			_			
A.3.2.1.1 (OP.				OF		(	)P.1		
PDSCH Refere			Config 1	SR.3.1	TDD		-		
measurement CORESET Ref				CR.3.1	LTDD				
Channel	referice		Config 1	CR.3.	טטוו		-		
SMTC configur	ration defined								
in A.3.11.1 and			Config 1	SMT	C.1	SN	MTC.1		
PDSCH/PDCC	H subcarrier	kHz	Config 1	10	20	100			
spacing			·	120		120			
TRS configura			Config 1	TRS.2.1 TDD		N/A			
TCI configurati EPRE ratio of I			Config 1	CSI-RS.	Config.0		N/A		
EPRE ratio of l to SSS EPRE ratio of l									
DMRS EPRE ratio of I to SSS	PDCCH DMRS								
EPRE ratio of I	PDCCH to								
PDCCH DMRS			Config 1	0		0			
EPRE ratio of I to SSS	PDSCH DMRS								
EPRE ratio of I PDSCH									
EPRE ratio of to SSS(Note 1)	)								
EPRE ratio of OCNG DMRS	OCNG to								
UE orientation axis and TBD a	around TBD	degrees	Config 1	N	A	-	ΓBD		
	ence in angle of	degrees	Config 1	NA		NA	TBD		
$N_{oc}^{\text{Note2}}$		dBm/15 kHz		-98			-98		
		Note5	Confirm 4				90		
$N_{oc}^{ m Note2}$		dBm/S CS Note4	Config 1	-8	9		-89		
SS-RSRP Note 3	3	dBm/S CS Note5	Config 1	-85	-85	-Infinity	-82		

$\hat{E}_{s}/I_{ot}$	dB	Config 1	4	4	-Infinity	7	
$\hat{E}_s/N_{oc}$	dB	Config 1	4	4	-Infinity	7	
Io <sup>Note3</sup>	dBm/95 .04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00	
Propagation Condition		Config 1	AWGN				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

160 for UE supporting other power class. In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2.4 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is used (PCell in FR2)

#### A.7.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.4.1-1, A.7.6.2.4.1-2, and A.7.6.2.4.1-3. The TCI status for cell2 is defined in table [TBD] and TRS configuration for cell2 is defined in table [TBD].

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.4.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.4.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2

Config	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: target NR cell ha	as the same SCS, BW and duplex mode as NR serving cell

Table A.7.6.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test		Value			Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel		Config 1	1, 2				Two FR1 NR carrier frequencies is
Number							used.
Active cell		Config 1	NR ce	II 1 (Pce	ell)		NR Cell 1 is on NR RF channel
							number 1.
Neighbour cell		Config 1	NR ce	II 2			NR cell 2 is on NR RF channel
Can Dattara Id		Confin 4	0		40		number 2.
Gap Pattern Id		Config 1	_		13		As specified in clause 9.1.2-1.
Measurement gap		Config 1	39		39		
offset		Confin 1	SSB.3	ED2			As appointed in alcuse A 2.10.2
SMTC-SSB parameters	٩D	Config 1		FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Norma	tl .			
TimeToTrigger	S	Config 1	0				
Filter coefficient		Config 1	0	•			L3 filtering is not used
DRX		Config 1	DRX	DRX	DRX	DRX	As specified in clause A.3.3
			.1	.2	.1	.2	
Time offset between		Config 1	3µs				Synchronous cells.
serving and neighbour							
cells							
T1	S	Config 1	5				
T2	S	Config 1	11	108	11	108	
			for	for	for	for	
			PC1;	PC1;		PC1;	
			6.5	67	6.5	67	
			for	for	for	for	
			othe	othe	othe	other	
			r PC	r PC	r PC	PC	

Table A.7.6.2.4.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

Parai	meter	Unit	Test	Cell 1		1 Cel			
			configuratio	T1	T1 T2		T2		
			n						
NR RF Channe	el Number		Config 1	,			2		
Duplex mode			Config 1	TE	DD	TDD			
TDD configurat	tion		Config 1	TDDConf.3.1		3.1 TDDConf.3.1			
BW <sub>channel</sub>		MHz	Config 1	100: N <sub>F</sub>	RB,c = 66	s,c = 66 100: N <sub>RB,c</sub> = 6			
BWP BW		MHz	Config 1	100: N <sub>RB,c</sub> = 66		s,c = 66 100: N <sub>RB,c</sub> =			
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		DLBWP.0.1			N/A

			-			
Initial UL BWP			ULBV	VP.0.1	1	N/A
Dedicated [ BWP	DL		DLBV	VP.1.1	1	N/A
Dedicated U BWP	JL		ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1	0	P.1	OP.1	
PDSCH Reference measurement channel		Config 1	SR.3.	1 TDD		-
CORESET Reference Channel		Config 1	CR.3.	1 TDD		-
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1	SM	TC.1	SM	ITC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1	1	20	1	120
TRS configuration		Config 1	TRS 2	.1 TDD	<u> </u>	N/A
TCI configuration		Config 1		.Config.0		V/A
EPRE ratio of PSS to SSS		Coming I	C31-K3	.comg.u	<u> </u>	<b>v</b> /
EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBC						
DMRS EPRE ratio of PDCCH DMR to SSS EPRE ratio of PDCCH to	S					
PDCCH DMRS	0	Config 1		0	0	
EPRE ratio of PDSCH DMR to SSS	5					
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)	3					
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
UE orientation around TBD axis and TBD axis	degrees	Config 1		IA .	Т	BD
Relative difference in angle arrival of cell 3 relative to ce 2		Config 1	N	IA	NA	TBD
$N_{oc}^{$	dBm/15 kHz Note5		-!	98	-	-98
$N_{oc}^{ m Note2}$	dBm/S CS Note4	Config 1		-89		-89
SS-RSRP Note 3	dBm/S CS Note5	Config 1	-85	-85 -85		-82
$\hat{E}_{s}/I_{ot}$	dB	Config 1	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1	4	4 4		7
Io <sup>Note3</sup>	dBm/95 .04 MHz Note5	Config 1	-57.55	-57.55	-Infinity	-56.00
Propagation Condition	1.0.00	Config 1	1	A	WGN	
· · · · · · · · · · · · · · · · · · ·	1 Condition Config 1 AWGN					

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant
	over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be
	fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6:	As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.6.2.4.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

6560 for UE supporting other power class. In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2.5 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1)

#### A.7.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.5.1-1, A.7.6.2.5.1-2, and A.7.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.5.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.5.1-1.

Table A.7.6.2.5.1-1 SA event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode
Note: The U	is only required to be tested in one of the supported test configurate	tions

Table A.7.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit Test		Va	lue	Comment	
		configurati on	Test 1	Test 2		
NR RF Channel Number		Config 1,2,3	1, 2		Two NR carrier frequencies is used.	
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.	
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.	
Gap Pattern Id		Config 1,2,3	0	13	As specified in clause 9.1.2-1.	
Measurement gap offset		Config 1,2,3	39	39		
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1	
on NR RF Channel 1		Config 2	SSB.1 FR1		As specified in clause A.3.10.1	
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1	
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.10.2	
offsetMO	dB	Config 1,2,3	6			
Hysteresis	dB	Config 1,2,3	0			
a4-Threshold	dBm	Config 1,2,3	TBD			
CP length		Config 1,2,3	Normal			
TimeToTrigger	S	Config 1,2,3	0			
Filter coefficient		Config 1,2,3	0		L3 filtering is not used	
DRX		Config 1,2,3	OFF		DRX is not used	
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.	
		Config 2,3	3μs		Synchronous cells.	
T1	S	Config 1,2,3	5			
T2	S	Config 1,2,3	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC		

Table A.7.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test	Cell 1 T1 T2		C	ell 2
		configuratio n			T1	T2
NR RF Channel Number		Config 1,2,3		1		2
Duplex mode		Config 1	F	DD	-	ΓDD
		Config 2,3	Т	TDD		ΓDD
TDD configuration		Config 1	Not Applicable		Not Applicable TDD	
		Config 2	TDDC	TDDConf.1.1		Conf.3.1

			Config 3	TDDC	onf.2.1	TDD	Conf.3.1
BWchannel		MHz	Config 1			$N_{RB,c} = 66$	
Directioning			Config 2		RB,c = 52		$N_{RB,c} = 66$
			Config 3	40: NRI	B,c = 106		$N_{RB,c} = 66$
BWP BW		MHz	Config 1		$R_{B,c} = 52$		$V_{RB,c} = 66$
			Config 2		$R_{B,c} = 52$	100: 1	$V_{RB,c} = 66$
			Config 3		B,c = 106		$V_{RB,c} = 66$
BWP	Initial DL		g a mig a		VP.0.1		N/A
configuration	BWP		ļ				
	Initial UL BWP		Config 1,2,3	ULBV	VP.0.1		N/A
	Dedicated DL BWP		Coming 1,2,3	DLBV	VP.1.1		N/A
	Dedicated UL BWP			ULBV	VP.1.1		N/A
OCNG Patterns A.3.2.1.1 (OP.1			Config 1,2,3	0	P.1	(	DP.1
PDSCH Refere			Config 1	SR 1	1 FDD		-
measurement of			Config 2		1 TDD	1	
			Config 3		1 TDD	1	
CORESET Ref	orongo				1 FDD		
Channel	CIGILOR		Config 1 Config 2		.1 FDD .1 TDD	+	-
Chamilei			Config 3		1 TDD	-	
SMTC configur	ation defined		Corning 5	OINZ.	1 100		
in A.3.11.1 and			Config 1	SM	TC.2	SMTC.2	
			Config 2,3	SM	TC.1	SM	/ITC.1
PDSCH/PDCCH subcarrier		kHz	Config 1,2	,	15		120
spacing			Config 3	3	30		120
EPRE ratio of F	PSS to SSS						
EPRE ratio of F to SSS	PBCH DMRS						
	PBCH to PBCH						
EPRE ratio of F	PDCCH DMRS						
to SSS	22						
EPRE ratio of F			Config 1,2,3		0		0
EPRE ratio of F to SSS	PDSCH DMRS						
EPRE ratio of F	PDSCH to						
PDSCH							
EPRE ratio of 0 to SSS(Note 1)							
EPRE ratio of (							
OCNG DMRS	(Note 1)						
UE orientation axis and TBD a	ixis	degrees	Config 1,2,3	<u> </u>	۱A	TBD	
Relative differe arrival of cell 3 2		degrees	Config 1,2,3	N	<b>IA</b>	NA TBD	
$N_{oc}$ Note2		dBm/15 kHz		N	NA TBD		TBD
		Note5	0 " 1 0		1.0		N.1.A
$N_{oc}^{ m Note2}$		dBm/S	Config 1,2		IA.		NA
		CS Note4	Config 3		√A		NA
SS-RSRP Note 3			Config 1,2	NA	NA	TBD	TBD

	dBm/S CS Note5	Config 3	NA	NA	TBD	TBD
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	NA	NA	-	•
	dBm/38 .16MHz	Config 3	NA	NA	1	-
	dBm/95 .04 MHz Note5	Config 1,2,3	-	-	TBD	TBD
Propagation Condition		Config 1,2,3		A\	WGN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2.6 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1)

### A.7.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.6.1-1, A.7.6.2.6.1-2, and A.7.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.6.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.6.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.6.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell							
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,							
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD							
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode							
Note: The L	Note: The UE is only required to be tested in one of the supported test configurations								

Table A.7.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Parameter Unit Test Value			Va	lue		Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2			Two NR carrier frequencies is used.	
Active cell		Config 1,2,3	NR ce	II 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR ce	II 2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1	FR1			As specified in clause A.3.10.1
on NR RF Channel 1		Config 2	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3	SSB.2	FR1			As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3	FR2			As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	TBD				
CP length		Config 1,2,3	Norma	al			
TimeToTrigger	S	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs				Synchronous cells.
T1	S	Config 1,2,3	5				
T2	S	Config 1,2,3	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.7.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test	Cell 1		C	ell 2
		configuratio n	T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3	,	1		2
Duplex mode		Config 1	F	OD	7	ΓDD
		Config 2,3	TI	DD	٦	ΓDD
TDD configuration		Config 1	Not Ap	plicable	TDDConf.3.1	
		Config 2	TDDC	onf.1.1	TDD	Conf.3.1
		Config 3	TDDC	onf.2.1	TDD	Conf.3.1
BW <sub>channel</sub>	MHz	Config 1	10: N <sub>RB,c</sub> = 52		10: N <sub>RB,c</sub> = 52 100: N <sub>RB</sub>	
		Config 2	10: N <sub>R</sub>	10: N <sub>RB,c</sub> = 52		$N_{RB,c} = 66$
		Config 3	40: N <sub>RE</sub>	3,c = 106	100: N	$N_{RB,c} = 66$

BWP BW		MHz	Config 1	10: N <sub>RI</sub>	<sub>B,c</sub> = 52	100: N	$N_{RB,c} = 66$		
			Config 2		B,c = 52		$N_{RB,c} = 66$		
			Config 3	40: N <sub>RB</sub>	s,c = 106	100: N	N <sub>RB,c</sub> = 66		
BWP configuration	Initial DL BWP			DLBW	/P.0.1		N/A		
	Initial UL BWP		Config 1,2,3		ULBWP.0.1		N/A		
	Dedicated DL BWP		Coming 1,2,5	DLBWP.1.1		N/A			
	Dedicated UL BWP			ULBW	/P.1.1	1	N/A		
OCNG Patterns A.3.2.1.1 (OP.1			Config 1,2,3	OF	P.1	C	)P.1		
PDSCH Refere	ence		Config 1	SR.1.	1 FDD		-		
measurement of	channel		Config 2	SR.1.	1 TDD				
			Config 3		1 TDD				
CORESET Ref	erence		Config 1		1 FDD		-		
Channel			Config 2		1 TDD	1			
			Config 3		1 TDD				
SMTC configuration A.3.11.1 and			Config 1	SM	ΓC.2	SN	ITC.2		
			Config 2,3	SM	ΓC.1	SN	ITC.1		
PDSCH/PDCCI	H subcarrier	kHz	Config 1,2	1	5		120		
spacing			Config 3	3	0		120		
EPRE ratio of F	PSS to SSS								
EPRE ratio of F to SSS									
EPRE ratio of F	PBCH to PBCH								
DMRS									
EPRE ratio of F	PDCCH DMRS								
to SSS EPRE ratio of F	DDCCII to								
PDCCH DMRS			Config 1,2,3	(	)	0			
EPRE ratio of F to SSS									
EPRE ratio of F	PDSCH to								
PDSCH									
EPRE ratio of C to SSS(Note 1)									
EPRE ratio of COCNG DMRS (	(Note 1)		0 " 105			_			
UE orientation a axis and TBD a	axis	degrees	Config 1,2,3		IA .		TBD		
Relative difference arrival of cell 3 2		degrees	Config 1,2,3	N	IA	NA	TBD		
		dBm/15		N	IA	-	TBD		
$N_{oc}^{ m Note2}$		kHz Note5			<del>.</del>		- <b>-</b>		
$N_{oc}^{ m Note2}$		dBm/S	Config 1,2	NA		٦	ГBD		
		CS Note4	Config 3		IA		ΓBD		
SS-RSRP Note 3		dBm/S	Config 1,2	NA	NA	TBD	TBD		
		CS Note5	Config 3	NA	NA	TBD	TBD		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	Config 1,2,3	NA	NA	TBD	TBD		
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	NA	NA	TBD	TBD		

Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	NA	NA	-	-		
	dBm/38 .16MHz	Config 3	NA	NA	-	-		
	dBm/95 .04 MHz Note5	Config 1,2,3	1	-	TBD	TBD		
Propagation Condition		Config 1,2,3	AWGN					

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2.7 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1)

### A.7.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

n this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.7.1-1, A.7.6.2.7.1-2, and A.7.6.2.7.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.7.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.7.1-1.

Table A.7.6.2.7.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell							
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,							
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD							
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode							
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations								

Table A.7.6.2.7.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Va	lue	Comment		
		configurati on	Test 1	Test 2			
NR RF Channel Number		Config 1,2,3	1, 2		1, 2		Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.		
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.		
Gap Pattern Id		Config 1,2,3	0	13	As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1,2,3	39	39			
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1		
on NR RF Channel 1		Config 2	SSB.1 FR1				As specified in clause A.3.10.1
		Config 3			As specified in clause A.3.10.1		
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.10.2		
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	TBD				
CP length		Config 1,2,3	Normal				
TimeToTrigger	S	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0		L3 filtering is not used		
DRX		Config 1,2,3	OFF		DRX is not used		
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.		
		Config 2,3	3μs		Synchronous cells.		
T1	s	Config 1,2,3	5				
T2	S	Config 1,2,3	7 for PC1; 7 for PC1; 4.5 for other PC PC				

Table A.7.6.2.7.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Para	meter	Unit	Test	Cel	I 1	С	ell 2
			configuratio	T1	T2	T1	T2
NR RF Channe	el Number		n Config 1,2,3	1			2
Duplex mode			Config 1	FD	חו	1	DD
Duplex mode			Config 2,3	TD		1	DD
TDD configura	TDD configuration		Config 1	Not Applicable		_	Conf.3.1
			Config 2	TDDCc			Conf.3.1
			Config 3	TDDCc			Conf.3.1
BW <sub>channel</sub>		MHz	Config 1	10: N <sub>RB</sub>	s,c = 52	100: N	$I_{RB,c} = 66$
			Config 2	10: N <sub>RB</sub>		100: N	√RB,c = 66
			Config 3	40: N <sub>RB</sub> ,		100: N	N <sub>RB,c</sub> = 66
BWP BW		MHz	Config 1	10: N <sub>RB</sub>			I <sub>RB,c</sub> = 66
			Config 2	10: N <sub>RB</sub>			I <sub>RB,c</sub> = 66
			Config 3	40: N <sub>RB,</sub>		100: N	$I_{RB,c} = 66$
BWP configuration	Initial DL BWP			DLBW	P.0.1	I	N/A
	Initial UL BWP			ULBW	P.0.1	ı	N/A
	Dedicated DL BWP		Config 1,2,3	DLBW	P.1.1	ı	N/A
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Pattern A.3.2.1.1 (OP.			Config 1,2,3	OP.1		C	)P.1
PDSCH Refere			Config 1	SR.1.1	FDD		-
measurement	channel		Config 2		SR.1.1 TDD		
			Config 3	SR2.1		-	
CORESET Ref	ference		Config 1		CR.1.1 FDD		_
Channel	0.0100		Config 2	CR.1.1		1	
			Config 3	CR2.1		-	
SMTC configuration A.3.11.1 and			Config 1	SMT	C.2	SN	ITC.2
			Config 2,3	SMTC.1		SM	ITC.1
PDSCH/PDCC	H subcarrier	kHz	Config 1,2	1:	5		120
spacing		_	Config 3	30			120
EPRE ratio of	PSS to SSS						
EPRE ratio of I	PBCH DMRS		1				
	PBCH to PBCH		-				
	PDCCH DMRS		1				
EPRE ratio of PDCCH to			Config 1,2,3	0	)		0
PDCCH DMRS  EPRE ratio of PDSCH DMRS			- 251.119 1,2,0	· ·	•		•
to SSS EPRE ratio of PDSCH to			-				
PDSCH EPRE ratio of (			-				
to SSS(Note 1)			_				
EPRE ratio of OCNG DMRS							

UE orientation around TBD axis and TBD axis	degrees	Config 1,2,3	NA		-	ГВD	
Relative difference in angle of arrival of cell 3 relative to cell 2	degrees	Config 1,2,3	NA		NA	TBD	
$N_{oc}^{ m Note2}$	dBm/15 kHz Note5		^	IA	NA		
$N_{oc}^{ m Note2}$	dBm/S	Config 1,2	N	IA		NA	
1 voc	CS Note4	Config 3	N	IA		NA	
SS-RSRP Note 3	dBm/S	Config 1,2	NA	NA	TBD	TBD	
	CS Note5	Config 3	NA	NA	TBD	TBD	
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA	NA	TBD	TBD	
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD	
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	NA	NA	-	-	
	dBm/38 .16MHz	Config 3	NA	NA	-	-	
	dBm/95 .04 MHz Note5	Config 1,2,3	-	-	TBD	TBD	
Propagation Condition		Config 1,2,3	2,3 AWGN				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.6.2.7.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.2.8 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1)

### A.7.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.8.1-1, A.7.6.2.8.1-2, and A.7.6.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.8.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.8.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.8.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell							
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,							
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD							
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode							
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations								

Table A.7.6.2.8.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Unit	Test	Value				Comment
	configurati	Test	Test	Test	Test	
	Config 1,2,3	1,2			4	Two NR carrier frequencies is used.
	Config 1,2,3	NR ce	II 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
	Config 1,2,3	NR ce	II 2			NR cell 2 is on NR RF channel number 2.
	Config 1,2,3	0		13		As specified in clause 9.1.2-1.
	Config 1,2,3	39		39		
	Config 1	SSB.1	FR1			As specified in clause A.3.10.1
	Config 2	SSB.1	FR1			As specified in clause A.3.10.1
	Config 3	SSB.2	FR1			As specified in clause A.3.10.1
	Config 1,2,3					As specified in clause A.3.10.2
dB	Config 1,2,3	6				
dB		0				
dBm		TBD				
		Norma	al			
S		0				
		0				L3 filtering is not used
	Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
	Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2,3	3µs				Synchronous cells.
S	Config 1,2,3	5				
S	Config 1,2,3	11 for PC1; 6.5 for othe r PCT	108 for PC1; 67 for othe r PCT	for PC1; 6.5 for othe r PCT	108 for PC1; 67 for other PCT BD	
	dB dB dBm s	Configurati	configurati on         Test 1           Config 1,2,3         1, 2           Config 1,2,3         NR ce           Config 1,2,3         NR ce           Config 1,2,3         0           Config 1,2,3         39           Config 1         SSB.1           Config 2         SSB.1           Config 3         SSB.2           Config 1,2,3         5SB.3           dB         Config 1,2,3         6           dB         Config 1,2,3         0           dBm         Config 1,2,3         TBD           Config 1,2,3         Normal           s         Config 1,2,3         0           Config 2,3         3µs           s         Config 1,2,3         5           s         Config 1,2,3         1           for         pC1;         6.5           for         othe         r	configurati on         Test 1         Test 2           Config 1,2,3         1, 2           Config 1,2,3         NR cell 1 (Pcell NR cell 2           Config 1,2,3         NR cell 2           Config 1,2,3         0           Config 1,2,3         39           Config 1         SSB.1 FR1           Config 2         SSB.1 FR1           Config 3         SSB.2 FR1           Config 1,2,3         SSB.3 FR2           dB         Config 1,2,3         6           dB         Config 1,2,3         0           dBm         Config 1,2,3         Normal           s         Config 1,2,3         Normal           s         Config 1,2,3         O           Config 1,2,3         O         DRX           Config 1,2,3         DRX         DRX           Config 1,2,3         S         S           Config 1,2,3         T         DRX           Config 2,3         T         DRX           s         Config 1,2,3         T           config 1,2,3         T         T           config 1,2,3         T         T           config 1,2,3         T         T           config 1,2,3<	configurati on         Test 1         Test 2         Test 3           Config 1,2,3         1, 2           Config 1,2,3         NR cell 1 (Pcell)           Config 1,2,3         NR cell 2           Config 1,2,3         0         13           Config 1,2,3         39         39           Config 1,2,3         39         39           Config 1,2,3         SSB.1 FR1         13           Config 2         SSB.1 FR1         14           Config 3         SSB.2 FR1         14           Config 1,2,3         SSB.3 FR2           dB         Config 1,2,3         6           dB         Config 1,2,3         0           dB         Config 1,2,3         TBD           Config 1,2,3         TBD         14           Config 1,2,3         TBD         15           Config 1,2,3         TBD         TBD           Config 1,2,3         TBD         TB	Configurati on         Test 1 2         Test 3         Test 4           Config 1,2,3         1, 2         Image: square squar

Table A.7.6.2.8.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Cell 1		С	ell 2						
		configuratio n	T1	T2	T1	T2						
NR RF Channel Number		Config 1,2,3	,			2						
Duplex mode		Config 1	FD	)D	7	TDD						
		Config 2,3	TD	)D	7	TDD						
TDD configuration		Config 1	Not App	olicable	TDD	Conf.3.1						
		Config 2	TDDConf.1.1		TDD	Conf.3.1						
		Config 3	TDDConf.2.1		TDDConf.2.1		TDD	Conf.3.1				
BW <sub>channel</sub>	MHz	Config 1	10: $N_{RB,c} = 52$		10: N <sub>RB,c</sub> = 52		10: N <sub>RB,c</sub> = 52		10: N <sub>RB,c</sub> = 52		100: N	$N_{RB,c} = 66$

		1	Config 2	10· N-	<sub>B,c</sub> = 52	100.1	N <sub>RB,c</sub> = 66	
			Config 3				$N_{RB,c} = 66$	
BWP BW		MHz		Config 1 10: N <sub>RB,c</sub> = 52			$N_{RB,c} = 66$	
		141112	Config 2				$N_{RB,c} = 66$	
			Config 3 40: N <sub>RB,c</sub> = 106		100: N <sub>RB,c</sub> = 66			
BWP Initial DL				DLBWP.0.1		N/A		
configuration	BWP		<u> </u>					
	Initial UL BWP		Config 1,2,3		BWP.0.1		N/A	
	Dedicated DL BWP		Coming 1,2,3	DLBV	DLBWP.1.1 N/A		N/A	
	Dedicated UL BWP			ULBWP.1.1			N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1		
PDSCH Reference			Config 1	SR.1.1 FDD		-		
measurement channel			Config 2		SR.1.1 TDD			
			Config 3	SR2.1 TDD		1		
CORESET Reference			Config 1	CR.1.1 FDD CR.1.1 TDD CR2.1 TDD		-		
Channel			Config 2					
			Config 3					
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.2		SN	ITC.2	
			Config 2,3	SM	ΓC.1	SMTC.1		
PDSCH/PDCCH subcarrier		kHz	Config 1,2	15		120		
spacing		10.12	Config 3 30		120			
EPRE ratio of I	PSS to SSS		J J J J J J J J J J J J J J J J J J J					
EPRE ratio of PBCH DMRS to SSS						0		
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS			Config 1,2,3					
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)								
UE orientation around TBD axis and TBD axis		degrees	Config 1,2,3	NA		TBD		
Relative difference in angle of arrival of cell 3 relative to cell 2		degrees	Config 1,2,3	NA		NA	TBD	
$N_{oc}$ Note2		dBm/15 kHz		NA		NA		
		Note5						
$N_{oc}^{$		dBm/S	Config 1,2	NA		NA		
		CS	Config 3	NA		NA		
SS-RSRP Note 3		Note4	Confir 4.0	NI A	N I A	TDD	TDD	
33-K3KP 11316		dBm/S CS	Config 1,2 Config 3	NA NA	NA NA	TBD TBD	TBD TBD	
		Note5	Coming 3	INA	INA	טפו	טסו	

$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2,3	NA	NA	TBD	TBD
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	NA	NA	TBD	TBD
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	NA	NA	-	-
	dBm/38 .16MHz	Config 3	NA	NA	-	-
	dBm/95 .04 MHz Note5	Config 1,2,3	-	-	TBD	TBD
Propagation Condition		Config 1,2,3		A\	WGN	•

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.3 L1-RSRP measurement for beam reporting

#### A.7.6.3.1 SSB based L1-RSRP measurement when DRX is not used

Editor's Note: to be added based on A.5.6.3.1.

#### A.7.6.3.2 SSB based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.7.6.3.1.

#### A.7.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

Editor's Note: to be added based on A.5.6.3.3.

#### A.7.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.7.6.3.3.

## A.7.7 Measurement Performance requirements

## A.7.7.1 SS-RSRP

# A.7.7.1.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.1.1 and 10.1.2.1.1 for intra-frequency measurements.

#### A.7.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.7.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra frequency measurements are tested by using the parameters in Table A.7.7.1.1.2-2 and A.7.7.1.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.7.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.1.1.2-2: SS-RSRP Intra frequency general test parameters

Parameter	Unit	Te	st 1	Test 2		Test 3	
	Offic	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Cell ID		TBD	TBD	TBD	TBD	TBD	TBD
SSB ARFCN			eq1	fre		fre	
Duplex mode			DD	TE			DD
TDD configuration			onf.3.1	TDDC			onf.3.1
BW <sub>channel</sub>	MHz		RB,c = 66		RB,c = 66		RB,c = 66
Downlink initial BWP configuration		DLBW	_	DLBW	_	DLBW	_
Bowinink initial Boot Cornigaration		P.0.1		P.0.1		P.0.1	
Downlink dedicated BWP configuration		DLBW	_	DLBW	_	DLBW	_
Downlink dedicated DVVI configuration		P.1.1		P.1.1		P.1.1	
Uplink initial BWP configuration		ULBW	-	ULBW	-	ULBW	-
Spirit minds 2111 Somigaration		P.0.1		P.0.1		P.0.1	
Uplink dedicated BWP configuration		ULBW	_	ULBW	-	ULBW	-
5,		P.1.1		P.1.1		P.1.1	
DDV I G G		Not		Not		Not	
DRX cycle configuration		applica	-	applica	-	applica	-
		ble		ble		ble	
TRS configuration		TRS.2.	-	TRS.2.	-	TRS.2.	-
•		1 TDD		1 TDD		1 TDD	
TCI state		TCI.Sta	-	TCI.Sta	-	TCI.Sta	-
		te.0 SR.3.1		te.0 SR.3.1		te.0 SR.3.1	
PDSCH Reference measurement channel		TDD	-	TDD	-		-
		טטו		CR.3.1		TDD	
RMSI CORESET Reference Channel		CR.3.1		TDD		CR.3.1	
KWSI CONESET Reference Charmer		TDD	_	100	-	TDD	_
		CCR.3.		CCR.3.		CCR.3.	
Control channel RMC		1 TDD	-	1 TDD	-	1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
		SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	SSB.1
SSB configuration		FR2	FR2	FR2	FR2	FR2	FR2
		SMTC.	SMTC.	SMTC.	SMTC.	SMTC.	SMTC.
SMTC configuration		1	1	1	1	1	1
Time offset with Cell 1	μs	-	3	-	3	-	3
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS				_			
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS							
EPRE ratio of PDSCH_DMRS to SSS	dB	0	0	0	0	0	0
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>							
EPRE ratio of OCNG to OCNG DMRS Note							
1							
$\hat{E}_s/N_{oc}$	dB	6	1	6	1	3	-1
Propagation conditions		+	i	Δ\Λ	'GN	i	
i ropagation conditions				7.11	511		

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.7.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

Doro		Unit	Tes	st 1	Tes	st 2	Test 3		
Para	Parameter		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2	
Angle of arrival confi	Angle of arrival configuration		According to		According to		According to		
Angle of anival config	guration		sectio	n TBD	sectio	n TBD	sectio	n TBD	
	NR_TDD_FR2_A						TE	3D	
	NR_TDD_FR2_B						TE	3D	
$N_{oc}^{\text{Note1}}$	NR_TDD_FR2_F	dBm/15kHz <sup>N</sup>	ТЕ	3D		3D	TE	3D	
	NR_TDD_FR2_G	ote4	1.	טכ	1.	טכ	TE	3D	
	NR_TDD_FR2_T						TE	3D	
	NR_TDD_FR2_Y						TBD		
	NR_TDD_FR2_A						TE	3D	
	NR_TDD_FR2_B				TBD		TBD		
$N_{oc}^{\text{Note1}}$	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>	ТЕ	3D			TBD		
	NR_TDD_FR2_G	3			''	100		TBD	
	NR_TDD_FR2_T						TBD		
	NR_TDD_FR2_Y						TE	3D	
	NR_TDD_FR2_A					TBD	TBD	TBD	
	NR_TDD_FR2_B				TBD		TBD	TBD	
SS-RSRPNote2	NR_TDD_FR2_F	dBm/SCS	TBD	TBD			TBD	TBD	
30-1\0\\1	NR_TDD_FR2_G	Note4	100	100	100	100	TBD	TBD	
	NR_TDD_FR2_T						TBD	TBD	
	NR_TDD_FR2_Y						TBD	TBD	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD	TBD	TBD	
	NR_TDD_FR2_A						TE	3D	
	NR_TDD_FR2_B						TE	3D	
lo <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	т	3D		3D	TE	3D	
10 "	NR_TDD_FR2_G	MHz Note4	16	טנ	''	טנ	TE	3D	
	NR_TDD_FR2_T						TE	3D	
	NR_TDD_FR2_Y						TBD		

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2.

# A.7.7.1.2 SA inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.1.1 and 10.1.5.1.2 for intra frequency measurements with the testing configurations for NR cells in Table A.7.7.1.2.1-1.

Table A.7.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

## A.7.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP intra frequency measurements are tested by using the parameters in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-1. The inter frequency measurements are supported by a measurement gap.

Table A.7.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Doromotor	Confin	Unit	Tes	st 1	Test 2		
Parameter	Config	Unit	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN	1~2		freq1	freq2	freq1	freq2	
BWchannel	1~2			)0: = 66	10 N <sub>RB,c</sub>	0: = 66	
Duplex mode	1~2		TDD	TDD	TDD	TDD	
TDD configuration	1~2		TDDC	onf.3.1	TDDC	onf.3.1	
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	-	SR.3.1 TDD	-	
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	-	CR.3.1 TDD	-	
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	-	CCR.3.1 TDD	-	
SSB configuration	1			1 FR2		1 FR2	
	2 1~2			2 FR2		2 FR2	
OCNG Patterns Initial BWP	1~2			P.1 /P.0.1	OF DL BW		
Configuration	1~2		ULBW		DLBWP.0.1 ULBWP.0.1		
Dedicated BWP	1~2			/P.1.3	DLBWP.1.3		
configuration	1~2		ULBW	/P.1.3	ULBWP.1.3		
TRS Configuration	1~2		TRS.2	.1 TDD	TRS.2.1 TDD		
PDCCH/PDSCH TCI Configuration	1~2		TCI.S	tate.2	TCI.State.2		
SMTC configuration	1~2		SMT	ΓC.1	SMTC.1		
Time offset between Cell 2 and Cell 3	1~2	μs	:	3	3		
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of PDSCH to PDSCH DMRS	1~2	dB	0	0	0	0	
EPRE ratio of OCNG to OCNG DMRS Note 1							

	Propaga	tion condition	1~2	-	AWGN AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total							
		transmitted pov	ver spectra	al density is	achieved for all OFDM sym	bols.	
	Note 2:	, , , , , , , , , , , , , , , , , , , ,					
		for $N_{oc}$ to be f	ulfilled.				

Table A.7.7.1.2.2-2: SS-RSRP inter-frequency OTA test parameters

motor	Config	Heit	Test 1		Test 2 NOTE 3			
iiiletei	Coming	Oiiit	Cell 1	Cell 2	Cell 1	Cell 2		
	1~4	dBm/15 kHz	TBD		n.a.			
	1,2	dBm/SS	TBD		n.a.			
	3,4	B SCS	TBD		n.a.			
	1~4	dB	TBD	TBD	n.a.			
	1,2	dBm/SC	TBD As in Table B.2.3			B.2.3-2		
	3,4	S	TBD		As in Table B.2.3-2			
	1~4	dBm/ 95.04M Hz	TBD		SS-RSRP+28.98			
	1~4	dB	TBD	TBD	n.a.			
Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise								
	ey are not settable RP minimum requ	1~4 1,2 3,4 1~4 1,2 3,4 1~4 1,2 3,4 1~4 2,2 3,4 1~4 2,2 3,4 1~4 2,2 3,4 3,4 3,4 3,4 3,4 3,4 3,4 3,4 3,4 3,4	1~4 dBm/15 kHz  1,2 dBm/SS 3,4 B SCS  1~4 dB  1,2 dBm/SC 3,4 S  1~4 dB  1,2 dBm/SC 3,4 S  dBm/ 1~4 dB  1~4 dB  RP and lo levels have been derived from by are not settable parameters themselves the service of the serv	1~4   dBm/15   TBD     1,2   dBm/SS   TBD     3,4   B SCS   TBD     1~4   dB   TBD     1,2   dBm/SC   TBD     1,2   dBm/SC   TBD     3,4   S   TBD     3,4   S   TBD     1,2   dBm/SC   TBD     3,4   S   TBD     1~4   dBm/   TBD     1~4   dB   TBD     1~4   dB   TBD     1~4   dB   TBD     RP and lo levels have been derived from other parameters are not settable parameters themselves.   RP minimum requirements are specified assuming in	1-4   dBm/15   KHz   TBD   TBD     1,2   dBm/SS   TBD   TBD     1,2   dBm/SC   TBD   TBD     1,2   dBm/SC   TBD   TBD     1,2   dBm/SC   TBD   TBD     3,4   S   TBD   TBD     1,2   dBm/ TBD   TBD     3,4   S   TBD   TBD     1-4   dB   TBD   TBD	Config		

## A.7.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the Abosute requirements in clauses 10.1.5.1.1 and Relative requirements in clause 10.1.5.1.2.

Note 3: No additional noise is added by the test system in Test 2.

# A.7.7.1.3 SA inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

## A.7.7.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.7.7.1.3.1-1.

Table A.7.7.1.3.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz	
	bandwidth, FDD duplex mode	
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz	120 kHz SSB SCS, 100 MHz
	bandwidth, TDD duplex mode	bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz	
	bandwidth, TDD duplex mode	

## A.7.7.1.3.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2 below. Both absolute and relative accuracy of RSRP intra frequency measurements are tested by using the parameters in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2. The inter frequency measurements are supported by a measurement gap.

Table A.7.7.1.3.2-1: SS-RSRP inter-frequency test parameters

Doromotor	Confin	l lmi4	Tes	st 1	Tes	st 2
Parameter	Config Unit		Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	1~3		freq1	freq2	freq1	freq2
	1		10:		10:	
			N <sub>RB,c</sub> = 52	400:	N <sub>RB,c</sub> = 52	100.
BW <sub>channel</sub>	2	MHz	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
			40:	14KB,C = 00	40:	14KB,C = 00
	3		$N_{RB,c} = 106$		$N_{RB,c} = 106$	
	1		FDD		FDD	
Duplex mode	2		TDD	TDD	TDD	TDD
	3		TDD		TDD	
	1		N/A		N/A	
TDD configuration	2		TDDConf. 1.1	TDDConf.	TDDConf. 1.1	TDDConf.
. 22 coga.ac			TDDConf.	3.1	TDDConf.	3.1
	3		2.1		2.1	
DDCCII Deference	1		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	2		SR.1.1 TDD	-	SR.1.1 TDD	-
measurement channel	3		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET	1		CR.1.1 FDD	-	CR.1.1 FDD	-
Reference Channel	2		CR.1.1 TDD	-	CR.1.1 TDD	-
. 10.0.0.00	3		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
Reference Channel	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3		CCR.2.1 TDD SSB.1	-	CCR.2.1 TDD SSB.1	-
	1		FR1		FR1	
SSB configuration	2		SSB.1	SSB.1	SSB.1	SSB.1
SSB configuration			FR1	FR2	FR1	FR2
	3		SSB.2		SSB.2	
			FR1		FR1	
OCNG Patterns	1~3			P.1	OF	
Initial BWP Configuration	1~3		DLBV ULBV	/P.0.1 /P.0.1	DLBW ULBW	
Dedicated BWP	4.0			/P.1.3	DLBW	
configuration	1~3			/P.1.3	ULBW	
TRS Configuration	1~3		TRS.2	.1 TDD	TRS.2	.1 TDD
PDCCH/PDSCH TCI Configuration	1~3		TCI.S	tate.2	TCI.S	tate.2
SMTC configuration	1~3		SM	 ΓC.1	SMT	 ΓC.1
Time offset between						
Cell 2 and Cell 3	1~3	μs		3	3	3
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS	1					
EPRE ratio of PBCH to	1~3	dB	0	0	0	0
PBCH DMRS			_			-
EPRE ratio of PDCCH	]					
DMRS to SSS						

EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH DMRS					
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation condition	1~3	-	AW	 	'GN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total

transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be

constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Table A.7.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters

Parameter	Config	Unit	Tes	st 1	Test 2	NOTE 3	
Farameter	Coming	Onit	Cell 1	Cell 2	Cell 1	Cell 2	
$N_{oc}$	1~4	dBm/15 kHz	TBD		n.a.		
$N_{oc}$	1,2	dBm/SS	TBD		n.a.		
1 oc	3,4	B SCS	TBD		n.a.		
$\hat{E}_{s}/I_{ot}$	1~4	dB	TBD TBD		n.a.		
SS-RSRP <sup>Note1</sup>	1,2	dBm/SC	TBD		As in Table B.2.3-2		
55-K5KP****	3,4	S	TBD		As in Table B.2.3-2		
Io <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	TBD		SS-RSRP+28.98		
$\hat{E}_s/N_{oc}$	1~4	dB	TBD	TBD	n.a.		

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

## A.7.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

## A.7.7.2 SS-RSRQ

## A.7.7.2.1 SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

## A.7.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8.1.1.

#### A.7.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.2.1.2-1. . The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.7.7.2.1.2-2 and Table A.7.7.2.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell.

Table A.7.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

Parameter	Test 1		st 1	Test 2		Test 3	
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		Fre	eq1	Freq1		Freq1	

Duplex mode			TD	DD	TD	D	TD	D
TDD configuration			TDDC	onf.3.1	TDDCo	nf.3.1	TDDC	onf.3.1
BW <sub>channel</sub>		MHz	100: N <sub>R</sub>	B,c = 66	100: NR	3,c = 66	100: N <sub>R</sub>	B,c = 66
	Initial DL BWP				DLBWI	P.0.1		
BWP configuration	Dedicated DL BWP				DLBWI			
DWI comigaration	Initial UL BWP				ULBWI	P.0.1		
	Dedicated UL BWP				ULBWI	P.1.1		
TRS configuration			TRS.2.		TRS.2.		TRS.2.	
Tite comigaration			1 TDD		1 TDD		1 TDD	
TCI state			TCI.Sta		TCI.Sta		TCI.Sta	
			te.0		te.0		te.0	
PDSCH Reference	measurement channel		SR.3.1		SR.3.1		SR.3.1	
			TDD		TDD		TDD	
RMSI CORESET R	eference Channel		CR.3.1	_	CR.3.1	-	CR.3.1	
			TDD		TDD		TDD	
Control channel RM	С		CCR.3.	_	CCR.3.	-	CCR.3.	-
			1 TDD		1 TDD		1 TDD	
	OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration					SMT			
SSB configuration			SSB.1	SSB.1	SSB.1	SSB.	SSB.1	SSB.1
			FR2	FR2	FR2	1 FR2	FR2	FR2
PDSCH/PDCCH sul		kHz	120	120	120	120	120	120
SS-RSSI-Measurem				ı	Not App	licable	ı	
EPRE ratio of PSS t								
EPRE ratio of PBCh	_							
EPRE ratio of PBCh								
EPRE ratio of PDC0								
	CH to PDCCH_DMRS	dB	0	0	0	0	0	0
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSSNote 1								
EPRE ratio of OCN	G to OCNG DMRS Note 1							
$\hat{E}_s/N_{oc}$		dB	3	3	-2.9	-2.9	-4	-4

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.7.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

Para	Parameter		Test 1		Test 2		Test 3	
Fala	meter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration			Accord	According to		ding to	According to	
Angle of anival coning	guration		clause /	4.3.15.1	clause A	۸.3.15.1	clause A	4.3.15.1
	NR_TDD_FR2_A				-100		-1	18
	NR_TDD_FR2_B						-11	7.5
Note1	NR_TDD_FR2_F	dBm/15kHz <sup>N</sup>	-95				-115.5	
	NR_TDD_FR2_G	ote4	-8	15	-10	JU	-1	15
	NR_TDD_FR2_T						-1	09
	NR_TDD_FR2_Y	1					-1	06
<b>∖</b> / Note1	NR_TDD_FR2_A	dBm/SCS <sup>Note</sup>					-1	09
$N_{oc}^{ m Note1}$	NR_TDD_FR2_B	ubili/SCS <sup>Note</sup>	-8	36	-9	-91		8.5
	NR_TDD_FR2_F	]					-106.5	

	NR_TDD_FR2_G						-1	06
	NR_TDD_FR2_T						-1	00
	NR_TDD_FR2_Y						-6	97
	NR_TDD_FR2_A						-113	-113
	NR_TDD_FR2_B						-112.5	-112.5
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	-83	-83	-94	-94	-110.5	-110.5
33-K3KP*****	NR_TDD_FR2_G	Note4	-03	-03	-94	-94	-110	-110
	NR_TDD_FR2_T						-104	-104
	NR_TDD_FR2_Y						-101	-101
	NR_TDD_FR2_A							
SS-RSRQ Note2	NR_TDD_FR2_B							
	NR_TDD_FR2_F	٩D	1177	1177	16.76	16.76	17.34T	17.34T
33-N3NQ*****	NR_TDD_FR2_G	uБ	dB -14.77 -14.77 -16.76 -16.76   17.34T BD	BD				
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	-1.76	-1.76	-4.7	-4.7	-5.46	-5.46
	NR_TDD_FR2_A						-77	.47
	NR_TDD_FR2_B						-76	.97
IoNote2	NR_TDD_FR2_F	dBm/95.04		-0	_	-0	-74	.97
10	NR_TDD_FR2_G	MHz Note4		50	-5	59	-74	.47
	NR_TDD_FR2_T						-68	.47
	NR_TDD_FR2_Y						-65.47	

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.

### A.7.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.8.1.1.

# A.7.7.2.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

### A.7.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

#### A.7.7.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 alnd Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.7.7.2.2.2-2 and Table A.7.7.2.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

Table A.5.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.7.2.2.2: SS-RSRQ Inter frequency general test parameters

Parameter	Unit	Tes	st 1	Tes	st 2	Test 3	
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode		TI	DD	T	DD	TE	DD
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	100: N	$_{RB,c} = 66$	100: N <sub>F</sub>	RB,C = 66	100: N <sub>F</sub>	$R_{B,C} = 66$
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PBCH to PBCH_DMRS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH to PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH to PDSCH_DMRS  EPRE ratio of OCNG DMRS to SSSNote 1	dB	0	0	0	0	0	0
$\hat{E}_s/N_{oc}$	dB	-1.75	-1.75	-1.75	-1.75	3	-1.75

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.5.7.2.2.3: SS-RSRQ Inter frequency OTA related test parameters

Poro	meter	Unit	Tes	st 1	Tes	st 2	Test 3		
Fala	meter	Onit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2	
AoA setup			Set	up 1	Setup 1		Setup 1		
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	NA	0	NA	0	NA	0	
	NR_TDD_FR2_A				·		-1°	18	
	NR_TDD_FR2_B				I		-117.5		
Note1	NR_TDD_FR2_F	dBm/15kHz <sup>N</sup>	,	)E	400		-11	-115.5	
	NR_TDD_FR2_G	ote4	-95		-100		-115		
	NR_TDD_FR2_T		-10				09		
	NR_TDD_FR2_Y						-106		
	NR_TDD_FR2_A						-10	09	
	NR_TDD_FR2_B						-108.5		
$N_{oc}$ Note1	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>		36	-6	11	-10	6.5	
	NR_TDD_FR2_G	3		00		, i	-10	06	
	NR_TDD_FR2_T							00	
	NR_TDD_FR2_Y						-9	)7	

	NR_TDD_FR2_A						-113	-113
	NR_TDD_FR2_B						-112.5	-112.5
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	-83	-83	-94	-94	-110.5	-110.5
33-K3KF*****	NR_TDD_FR2_G	Note4	-03	-03	-94	-94	-110	-110
	NR_TDD_FR2_T						-104	-104
	NR_TDD_FR2_Y						-101	-101
	NR_TDD_FR2_A							
	NR_TDD_FR2_B							
SS-RSRQ <sup>Note2</sup>	NR_TDD_FR2_F	٩D	TBD	TBD	TBD	TBD	TBD	TBD
	NR_TDD_FR2_G	dB	100	180	100			
	NR_TDD_FR2_T							
	NR_TDD_FR2_Y							
$\hat{E}_{s}/I_{ot}$		dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
	NR_TDD_FR2_A						-77	.47
	NR_TDD_FR2_B	1					-76	5.97
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04		-0		-0	-74	.97
10140162	NR_TDD_FR2_G	MHz Note4	-5	50	-:	59	-74	.47
	NR_TDD_FR2_T						-68	3.47
	NR TDD FR2 Y						-65.47	

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.

#### A.7.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.1.1 and 10.1.9.1.2.

## A.7.7.3 SS-SINR

# A.7.7.3.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

## A.7.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.13.1.1.

#### A.7.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.7.7.3.1.2-2 and Table A.7.7.3.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.7.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parameter	Unit	Test 1		Test 2		Test 3		
raiailletei	Offic	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN		Fre	eq2	Fre	eq2	Fre	eq2	
Duplex mode		T	DD	T	DD	TDD		
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	TDDConf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	RB,c = 66	100: N <sub>F</sub>	RB,c = 66	100: N <sub>R</sub>	B,c = 66	
Downlink initial BWP configuration				DLBV	VP.0.1			
Downlink dedicated BWP configuration				DLBV	VP.1.1			
Uplink initial BWP configuration				ULBV	VP.0.1			
Uplink dedicated BWP configuration				ULBV	VP.1.1			
DRX cycle configuration	ms			Not ap	plicable			
TRS configuration				TRS.2	.1 TDD			
TCI state				TCI.S	State.0			
AoA setup			S	etup 3 defi	ned in A.3.	15		
·		SR.3.1		SR.3.1		SR.3.1		
PDSCH Reference measurement channel		TDD		TDD		TDD		
DMCI CODECET Deference Channel		CR.3.1		CR.3.1		CR.3.1		
RMSI CORESET Reference Channel		TDD	-	TDD	-	TDD		
Dedicated RMSI CORESET Reference		CCR.3		CCR.3.		CCR.3.		
Channel		.1 TDD	-	1 TDD	-	1 TDD	-	
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1	
SMTC configuration		SMTC.1						
SSB configuration		SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	
33B configuration		FR2	FR2	FR2	FR2	FR2	FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120	
SS-RSSI-Measurement				Not Ap	plicable			
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0	0	0	
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSSNote 1								
EPRE ratio of OCNG to OCNG DMRS Note 1								
A /v						mp.p.		
$\hat{E}_s/N_{oc}$	dB	TBD	TBD	TBD	TBD	TBD	TBD	
Note 1: OCNG shall be used such that bot		allocated	and a cons	stant total t	ransmitted	power spe	ectral	

density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They Note 3: are not settable parameters themselves.

Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.7.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

Parameter		Unit Tes		st 1	Test 2		Test 3	
	Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival	ngle of arrival configuration		According to			According to		ding to
3			clause	use A.3.8.X clause A.3.8.		A.3.8.X	clause A.3.8.X	
λ/ Note1	NR_TDD_FR2_A	dBm/15kHz					TB	D
$N_{oc}^{ m Note1}$	NR_TDD_FR2_B	Note4	TBD		TBD		TBD	
	NR TDD FR2 F						TBD	

	NR_TDD_FR2_G						TE	3D
	NR_TDD_FR2_T						TE	3D
	NR_TDD_FR2_Y						TE	3D
	NR_TDD_FR2_A						TBD	
	NR_TDD_FR2_B						TE	3D
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS	т.	3D	т.	3D	TE	3D
	NR_TDD_FR2_G	Note3	1.0	טכ	11	טכ	TE	3D
	NR_TDD_FR2_T						TE	3D
	NR_TDD_FR2_Y						TBD	
	NR_TDD_FR2_A						TBD	TBD
	NR_TDD_FR2_B						TBD	TBD
SS-RSRPNote2	NR_TDD_FR2_F	dBm/SCS	TBD	TBD	TBD	TBD	TBD	TBD
30-K3KF	NR_TDD_FR2_G	Note4	100	100	100	100	TBD	TBD
	NR_TDD_FR2_T						TBD	TBD
	NR_TDD_FR2_Y						TBD	TBD
	NR_TDD_FR2_A						TBD	TBD
	NR_TDD_FR2_B						TBD	TBD
SS-SINR Note2	NR_TDD_FR2_F	dB	TBD	D TBD	TBD	TBD	TBD	TBD
33-311VIX	NR_TDD_FR2_G	uБ	יסטו יסטו	100	160	TBD	TBD	
	NR_TDD_FR2_T						TBD	TBD
	NR_TDD_FR2_Y						TBD	TBD
$\mathbf{\hat{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD	TBD	TBD
	NR_TDD_FR2_A						TE	3D
	NR_TDD_FR2_B	dBm/95.04					TE	3D
Io <sup>Note2</sup>	NR_TDD_FR2_F	MHz	т.	3D	т.	3D	TE	3D
10	NR_TDD_FR2_G	Note4	"	טנ	"	טט	TE	3D
	NR_TDD_FR2_T						TBD	
	NR_TDD_FR2_Y						TBD	

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.

## A.7.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.13.1.1.

# A.7.7.3.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

## A.7.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

### A.7.7.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 alnd Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.7.7.3.2.2-2 and Table A.7.7.3.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.7.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.3.2.2-2: SS-SINR Inter frequency general test parameters

Parameter	Unit	Tes	st 1	Tes	est 2 Test		st 3
Farameter	Offic	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		freq1 freq2		freq1	freq2	freq1	freq2
Duplex mode			DD	TDD		TDD	
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	100: N	RB,c = 66		RB,c = 66	100: N <sub>F</sub>	RB,C = 66
Downlink initial BWP configuration				DLBV			
Downlink dedicated BWP configuration				DLBV			
Uplink initial BWP configuration					/P.0.1		
Uplink dedicated BWP configuration					/P.1.1		
DRX cycle configuration	ms				olicable		
TRS configuration					.1 TDD		
TCI state					tate.0		
AoA setup			Se	etup 3 defii	ned in A.3.		
		SR.3.1		SR.3.1		SR.3.1	
PDSCH Reference measurement channel		TDD	-	TDD	-	TDD	-
D1404 00D 505 T D (		CR.3.1		CR.3.1		CR.3.1	
RMSI CORESET Reference Channel		TDD	-	TDD	-	TDD	-
		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
OCNG Patterns		UP.1	UP.1	UP.1	OP.1	OP.1	OP.1
		SMTC.	SMTC.	SMTC.	SMTC.	SMTC.	SMTC.
SMTC configuration		1 FR2	1 FR2	1 FR2	1 FR2	1 FR2	1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS	KIIZ	120	120	120	120	120	120
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0	0	0
EPRE ratio of PDSCH_DMRS to SSS	1						
EPRE ratio of PDSCH to PDSCH_DMRS	1						
EPRE ratio of OCNG DMRS to SSSNote 1	1						
	dB	TBD	TBD	TBD	TBD	TBD	TBD
$\hat{E}_s/N_{oc}$	UD	טסו	עסו	טסו	טסו	טסו	טסו

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.7.7.3.2.2-3: SS-SINR Inter frequency OTA related test parameters

Parameter		l lmit	Tes	st 1	Test 2		Test 3	
Par	ameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
UE orientation arou	nd TBD axis and TBD	degrees	TBD		TBD		TBD	
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	NA	TBD	NA	0	NA	0
	NR_TDD_FR2_A						TE	3D
	NR_TDD_FR2_B						TE	3D
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/15kHz		3D		3D	TE	3D
00	NR_TDD_FR2_G	Note4	1.5	טט	1.0	טט	TE	3D
	NR_TDD_FR2_T						TE	3D
	NR_TDD_FR2_Y							3D
	NR_TDD_FR2_A						TE	3D
	NR_TDD_FR2_B				TBD		TBD	
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS Note3		3D			TBD	
	NR_TDD_FR2_G		1.5	טט			TBD	
	NR_TDD_FR2_T						TBD	
	NR_TDD_FR2_Y						TE	3D
	NR_TDD_FR2_A			TBD TBD	TBD	TBD	TBD	TBD
	NR_TDD_FR2_B	dBm/SCS Note4					TBD	TBD
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F		TRD				TBD	TBD
00-10101	NR_TDD_FR2_G		100				TBD	TBD
	NR_TDD_FR2_T						TBD	TBD
	NR_TDD_FR2_Y						TBD	TBD
	NR_TDD_FR2_A						TBD	TBD
	NR_TDD_FR2_B						TBD	TBD
SS-SINR <sup>Note2</sup>	NR_TDD_FR2_F	dB	TBD	TBD	TBD	TBD	TBD	TBD
33-SINK	NR_TDD_FR2_G	ub.	100	100	100	100	TBD	TBD
	NR_TDD_FR2_T						TBD	TBD
	NR_TDD_FR2_Y						TBD	TBD
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD	TBD	TBD	TBD
	NR_TDD_FR2_A			· · · · · · · · · · · · · · · · · · ·			TE	3D
	NR_TDD_FR2_B	dBm/95.04					TE	3D
lo <sup>Note2</sup>	NR_TDD_FR2_F	MHz	т.	3D	т:	3D	TE	3D
10	NR_TDD_FR2_G	Note4	''	טט	''	טט	TE	3D
	NR_TDD_FR2_T						TE	3D
	NR_TDD_FR2_Y						TBD	

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 2: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 6: NR operating band groups are as defined in clause 3.5.2.

## A.7.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.15.1.1 and 10.1.15.1.2.

## A.7.7.4 L1-RSRP measurement for beam reporting

## A.7.7.4.1 SSB based L1-RSRP measurement

#### A.7.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.7.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.7.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only it	required to be tested in one of the supported test configurations

## A.7.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2.

here is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.7.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD Configuration	1~2		TDDConf.3.1	TDDConf.3.1
BWchannel	1~2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2	SSB.1 FR2
	2		SSB.2 FR2	SSB.2 FR2
OCNG Patterns	1~2		OP.1	OP.1
Initial BWP Configuration	1~2		DLBWP.0.1	DLBWP.0.1
Tindar BVVI Cornigaration	' -		ULBWP.0.1	ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3	DLBWP.1.3
			ULBWP.1.3	ULBWP.1.3
TRS Configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2	TCI.State.2
SMTC configuration	1~2		SMTC.1	SMTC.1
reportConfigType	1~2		periodic	periodic
reportQuantity	1~2		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1~2		2	2
L1-RSRP reporting period	1~2		Tslot640	Tslot640
Propagation condition	1~2		AWGN	AWGN
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS	1~2	dB	0	0
EPRE ratio of PDSCH to PDSCH DMRS	1			
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Test 2 NOTE 3 **Parameter** Config Unit SSB0 SSB1 SSB0 SSB<sub>1</sub> dBm/15  $N_{oc}$ 1~4 **TBD** n.a. kHz 1,2 n.a. dBm/SS **TBD**  $N_{oc}$ 3,4 **B SCS** TBD n.a.  $\hat{E}_{s}/I_{o}$ 1~4 dB **TBD TBD** n.a. TBD As in Table B.2.4-2 1,2 dBm/SC SS-RSRPNote1 3,4 S TBD As in Table B.2.4-2 dBm/ IoNote1 SS-RSRP+28.98 95.04M TBD 1~4 Hz  $\hat{E}_{s}/N_{oc}$ dB **TBD** 1~4 TRD n.a.

Table A.7.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters

- Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 3: No additional noise is added by the test system in Test 2.

## A.7.7.4.1.3 Test Requirements

For at least one reported L1-RSRP during 480ms, the accuracy for SSB#0 and SSB#1 of Cell 1 shall fulfil the requirements in clauses 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of TBD.

## A.7.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

### A.7.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.7.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.7.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

	Config	Description					
1		NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode					
Note	Note: The UE is only required to be tested in one of the supported test configurations						

#### A.7.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.7.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1		freq1	freq1
Duplex mode	1		TDD	TDD
TDD Configuration	1		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	1	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2	SSB.1 FR2
OCNG Patterns	1		OP.1	OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2	TCI.State.2
SMTC configuration	1		SMTC.1	SMTC.1
CSI-RS	1		CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
reportConfigType	1		periodic	periodic
reportQuantity	1		cri-RSRP	cri-RSRP
Number of reported RS	1		2	2
L1-RSRP reporting period	1		slot80	slot80
Propagation condition	1		AWGN	AWGN
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH				
DMRS	1	dB	0	0
EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH	'	uБ		
DMRS				
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Parameter	Config Unit		Test 1		Test 2 NOTE 3	
Parameter	Config	Unit	SSB0	SSB1	SSB0	SSB1
$N_{oc}$	1~4	dBm/15 kHz	TBD		n.a.	
$N_{oc}$	1,2	dBm/SS	TBD	TBD		
TV oc	3,4	B SCS	TBD		n.a.	
$\hat{E}_{_{\mathrm{s}}}/I_{_{\mathrm{ot}}}$	1~4	dB	TBD	TBD	n.a.	
SS-RSRPNote1	1,2	dBm/SC	TBD TBD		As in Table B.2.4-2	
55-R5RP10001	3,4	S			As in Table B.2.4-2	
Io <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	TBD		SS-RSRP+28.98	
$\hat{E}_s/N_{oc}$	1~4	dB	TBD TBD		n.a.	

Table A.7.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

- Note 1: RSRP and lo levels have been derived from other parameters for information purposes.
- They are not settable parameters themselves.

  Note 2: RSRP minimum requirements are specified assuming independent in
- Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 3: No additional noise is added by the test system in Test 2.

## A.7.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.20.2. The reported L1-RSRP value shall include the Rx antenna gain in the range of TBD.

## A.8 E-UTRA standalone tests for NR RRM

Editor notes: All NR RRM tests under E-UTRA standalone operations are included in this Annex. All EN-DC related NR RRM tests are in A.6

## A.8.1 Void

## A.8.2 RRC\_IDLE state mobility

## A.8.2.1 Inter-RAT NR Cell re-selection

## A.8.2.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

## A.8.2.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in clause 4.2.2.5.6 in TS 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell as given in tables A.8.2.1.1.1-1, A.8.2.1.1.1-2, A.8.2.1.1.1-3 and A.8.2.1.1.1-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

Table A.8.2.1.1.1-1: Supported test configurations

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE	is only required to be tested in one of the supported test configurations

Table A.8.2.1.1.1-2: General test parameters for E-UTRA cell re-selection FR1 NR cell test case

Parameter		Unit	Test	Value	Comment
			configuration		
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T3 period the UE reselects to cell 2
T3 end	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	during T3
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	]
RF Channe	el Number		1, 2, 3, 4, 5, 6	1, 2	E-UTRAN radio channel (1) and NR radio channel (2) are used for this test
Time offset	t between cells		1, 4	3 ms	Asynchronous cells
			2, 5	3 μs	Synchronous cells
			3, 6	3 μs	Synchronous cells
Access Ba	rring Information	-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle	length	s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACE	H configuration index		1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		S	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re- selection reaction time is taken into account.
T2		S	1, 2, 3, 4, 5, 6	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
Т3		S	1, 2, 3, 4, 5, 6	75	T3 needs to be defined so that cell re- selection reaction time is taken into account.

Table A.8.2.1.1.1-3: Cell specific test parameters for NR cell 2

Parameter	Unit	Test	Cell 2			
		configuration	T1	T2	T3	
TDD configuration		1, 4		N/A		
		2, 5 TDDConf.1.1				
		3, 6		TDDConf.2.1		
PDSCH Reference		1, 4		SR.1.1 FDD		
measurement channel		2, 5	SR.1.1 TDD			
		3, 6		SR.2.1 TDD		
RMSI CORESET		1, 4		CR.1.1 FDD		
Reference Channel		2, 5	CR.1.1 TDD			
		3, 6		CR.2.1 TDD		

RMC CORESET		1, 4		CCR.1.1 FDD	
Reference Channel		2, 5		CCR.1.1 TDD	
Reference Chamilei				CCR.2.1 TDD	
OCNG Patterns		3, 6			
		1, 2, 3, 4, 5, 6		OP.1 SMTC.1	
SMTC configuration		1, 2, 3, 4, 5, 6			
SSB configuration		1, 4		SSB.1 FR1	
		2, 5		SSB.1 FR1	
		3, 6		SSB.2 FR1	
Initial DL BWP		1, 2, 3, 4, 5, 6		DLBWP.0.1	
configuration					
Initial UL BWP		1, 2, 3, 4, 5, 6		ULBWP.0.1	
configuration					
RLM-RS		1, 2, 3, 4, 5, 6		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5		-140	
		3, 6		-137	
Pcompensation	dB	1, 2, 3, 4, 5, 6		0	
Qhysts	dB	1, 2, 3, 4, 5, 6		0	
Qoffsets, n	dB	1, 2, 3, 4, 5, 6		0	
Cell_selection_and_		1, 2, 3, 4, 5, 6			
reselection_quality_m				SS-RSRP	
easurement					
$\hat{E}_s/I_{ot}$	dB	1, 4	-4	-infinity	12
S / Tot		2, 5			
		3, 6			
$N_{oc}$ Note2	dBm/SCS	1, 4		-98	
T ♥ <sub>OC</sub>		2, 5		-98	
		3, 6		-95	
$N_{oc}$ Note2	dBm/15 kHz	1, 4		-98	
TV <sub>oc</sub>		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4	-4	-infinity	12
$E_s/IV_{oc}$		2, 5		,	
		3, 6			
SS-RSRP Note3	dBm/SCS	1, 4	-102	-infinity	-86
33 113111	G.2, C C C	2, 5	-102	-infinity	-86
		3, 6	-99	-infinity	-83
lo	dBm/9.36 MHz	1, 4	-68.60	-infinity	-57.78
	dBm/9.36 MHz	2, 5	-68.60	-infinity	-57.78
	dBm/38.16 MHz	3, 6	-62.50	-infinity	-51.69
Treselection	S	1, 2, 3, 4, 5, 6	02.50	0	0
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	<u> </u>	Not sent	<u> </u>
Thresh <sub>x, high</sub>	dB	1, 2, 3, 4, 5, 6		48	
Thresh <sub>serving, low</sub>	dB	1, 2, 3, 4, 5, 6		44	
Thresh <sub>x, low</sub>	dB	1, 2, 3, 4, 5, 6		50	
Propagation Condition	UD				
	a used such that both	1, 2, 3, 4, 5, 6		AWGN	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.8.2.1.1.1-4: Cell specific test parameters for E-UTRA cell 1

Parameter	Unit	Cell 1				
		T1	T2	T3		
E-UTRA RF Channel number			1			
BW <sub>channel</sub>	MHz	MHz 10				
OCNG Patterns defined in TS 36.133 [15]			for test configur			
clause A.3.2		OP.2 FDD	for test configu	ation 4, 5, 6		
PBCH_RA	dB					
PBCH_RB	dB					
PSS_RA	dB					
SSS_RA	dB					
PCFICH_RB	dB					
PHICH_RA	dB					
PHICH_RB	dB		0			
PDCCH_RA	dB					
PDCCH_RB	dB					
PDSCH_RA	dB					
PDSCH_RB	dB					
OCNG_RA <sup>Note 1</sup>	dB					
OCNG_RB <sup>Note 1</sup>	dB					
Qrxlevmin	dBm		-140			
$N_{oc}$ Note 2	dBm/15 kHz		-98			
RSRP Note 3	dBm/15 KHz	-84	-84	-84		
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	14	14	14		
$\hat{E}_s/N_{oc}$	dB	14	14	14		
Treselection <sub>EUTRAN</sub>	S		0	•		
Snonintrasearch	dB		50			
Thresh <sub>x, high</sub>	dB		48			
Thresh <sub>serving, low</sub>	dB		44			
Thresh <sub>x, low</sub>	dB		50			
Propagation Condition			AWGN			
Note 1: OCNG shall be used such that both	cells are fully alloca	ated and a cons	stant total transi	mitted power		
spectral density is achieved for all C				•		

spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

RSRP levels have been derived from other parameters for information purposes. They are not Note 3: settable parameters themselves.

#### A.8.2.1.1.2 **Test Requirements**

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, \, NR} + T_{evalu$  $T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR} + T_{SI-NR}$ ,

Where:

Thigher\_priority\_search See clause 4.2.2 in TS 36.133 [15]

T<sub>evaluate, NR</sub> See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## A.8.3 RRC CONNECTED state mobility

## A.8.3.1 Handover

#### A.8.3.1.1 E-UTRAN - NR handover in FR1

#### A.8.3.1.1.1 Test Purpose and Environment

This test shall verify the E-UTRAN to NR FR1 handover requirements as specified in clause 6.1.2.1 specified in clause 5.3.4 in TS 36.133 [15].

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN and Cell 2 is an inter-RAT NR neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [15] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.8.3.1.1-1. General test parameters are provided in Table A.8.3.1.1-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.8.3.1.1-3 and A.8.3.1.1-4 respectively.

Table A.8.3.1.1-1: Supported test configurations for E-UTRAN inter-RAT NR handover

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE i	s only required to be tested in one of the supported test configurations

Table A.8.3.1.1-2: General test parameters for E-UTRAN inter-RAT NR handover

Par	ameter	Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in
				the test
LTE RF Channel N	lumber		2	1 E-UTRAN carrier frequency is
				used in the test
Initial conditions	Active cell		Cell 1	E-UTRAN cell
	Neighbouring cell		Cell 2	NR cell
Final condition	Active cell		Cell 2	
NR measurement	quantity		SS-RSRP	
E-UTRAN measur	ement quantity		RSRP	
b2-Threshold1		dBm	-84	Absolute E-UTRAN RSRP
				threshold for event B2
b2-Threshold2NR		dBm	As specified in Table	Absolute NR SS-RSRP threshold
			A.8.3.1.1-4	for event B2
Hysteresis		dB	0	
TimeToTrigger		S	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Inf	ormation	-	Not sent	No additional delays in random
3				access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 8.1.2.1-1
				started before T2 starts [15]
T1		S	5	
T2	·	S	≤5	
T3		S	1	

Table A.8.3.1.1-3: Cell specific test parameters for E-UTRAN inter-RAT NR handover (Cell 1)

Parameter	Unit	Configuration	Cell 1		
			T1	T2	Т3
RF channel number		1, 2, 3, 4, 5, 6		2	
Duplex mode		1, 2, 3		FDD	
		4, 5, 6		TDD	
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6		6	
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6		1	
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6		5 MHz: N <sub>RB,c</sub> = 25	
				10 MHz: $N_{RB,c} = 50$	
			2	$0 \text{ MHz: } N_{RB,c} = 10$	0
PRACH Configuration <sup>Note2</sup>		1, 2, 3		4	
		4, 5, 6		53	
PDSCH parameters:		1, 2, 3		5 MHz: R.7 FDD	
DL Reference Measurement				10 MHz: R.3 FDD	
Channel <sup>Note3</sup>				20 MHz: R.6 FDD	
		4, 5, 6		5 MHz: R.4 TDD	
				10 MHz: R.0 TDD	
				20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH		1, 2, 3		5 MHz: R.11 FDD	
parameters:				10 MHz: R.6 FDD	
DL Reference Measurement				20 MHz: R.10 FDE	
Channel <sup>Note3</sup>		4, 5, 6		5 MHz: R.11 TDD	
				10 MHz: R.6 TDD	
N				20 MHz: R.10 TDE	
OCNG Patterns <sup>Note3</sup>		1, 2, 3		MHz: OP.20 FDI	
			1	0 MHz: OP.10 FD	D

			20	) MHz: OP.17 F[	DD
		4, 5, 6	5 MHz: OP.9 TDD		D
		, ,	10 MHz: OP.1 TDD		D
			2	0 MHz: OP.7 TD	D
PBCH_RA		1, 2, 3, 4, 5, 6			
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB	dB			0	
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA <sup>Note4</sup>					
OCNG_RB <sup>Note4</sup>					
N <sub>oc</sub> Note5	dBm/15kHz	1, 2, 3, 4, 5, 6		-98	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	7	7	7
Ê <sub>s</sub> /I <sub>ot</sub> Note6	dB	1, 2, 3, 4, 5, 6	7	7	7
RSRP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-91	-91	-91
SCH_RPNote6	dBm/15kHz	1, 2, 3, 4, 5, 6	-91	-91	-91
Io <sup>Note6</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-62.43	-62.43	-62.43
Propagation Condition		1, 2, 3, 4, 5, 6		AWGN	
Antenna Configuration and Correlation Matrix Note7		1, 2, 3, 4, 5, 6		1x2 Low	

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
- Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 6: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.3.1.1-4: Cell specific test parameters E-UTRAN inter-RAT NR handover (Cell 2)

Para	meter	Unit	Configuration		Cell 2		
				T1	T2	T3	
RF channel numb	er		1, 2, 3, 4, 5, 6		1		
Duplex mode			1, 4		FDD		
			2, 3, 5, 6		TDD		
TDD Configuration	n		2, 5		TDDConf.1.1		
			3, 6		TDDConf.1.2		
BW <sub>channel</sub>	BW <sub>channel</sub>		1, 4	10: $N_{RB,c} = 52$ (FDD)		DD)	
			2, 5	10: $N_{RB,c} = 52 \text{ (TDD)}$			
			3, 6	40:	$N_{RB,c} = 106 (T$	DD)	
PDSCH reference	measurement		1, 4		SR.1.1 FDD		
channel			2, 5		SR.1.1 TDD		
			3, 6		SR.2.1 TDD		
CORSET reference	CORSET reference channel		1, 4		CR.1.1 FDD		
			2, 5		CR.1.1 TDD		
			3, 6	•	CR.2.1 TDD	•	
OCNG pattern <sup>Note</sup>	OCNG pattern <sup>Note1</sup>		1, 2, 3, 4, 5, 6	·	OP.1		
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6		DLBWP.0.1		

	Dedicated DL BWP				DLBWP.1.1	
	Initial UL BWP				ULBWP.0.1	
	Dedicated UL BWP				ULBWP.1.1	
SMTC configuration			1, 2, 3, 4, 5, 6		SMTC.1	
SSB configuration			1, 2, 4, 5		SSB.1 FR1	
· ·			3, 6		SSB.2 FR1	
b2-Threshold2NR		-ID	1, 2, 4, 5		-105	
		dBm	3, 6		-103	
EPRE ratio of PSS	S to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PB0	CH_DMRS to SSS		, , , , ,			
EPRE ratio of PB0						
PBCH_DMRS						
EPRE ratio of PD	CCH DMRS to					
SSS						
EPRE ratio of PDCCH to						
PDCCH DMRS				0		
EPRE ratio of PDS	SCH DMRS to					
SSS						
EPRE ratio of PDS	SCH to					
PDSCH_DMRS						
EPRE ratio of OC	NG DMRS to SSS					
EPRE ratio of OC	NG to OCNG					
DMRS						
N <sub>oc</sub> Note2		dBm/15 KHz	1, 2, 3, 4, 5, 6	-98		
Noc <sup>Note2</sup>		dBm/SCS	1, 2, 4, 5		-98	
INoc			3, 6		-95	
Ês/Noc		dB	1, 2, 3, 4, 5, 6	-inifinit	0	0
Ês/Iot <sup>Note3</sup>		dB	1, 2, 3, 4, 5, 6	-inifinit	0	0
SS-RSRP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	-inifinit	-98	-98
			3, 6	-inifinit	-95	-95
. Nove		dBm/9.36 MHz	1, 2, 4, 5	-70.05	-67.04	-67.04
Io <sup>Note3</sup>		dBm/38.16 MHz	3, 6	-63.96	-60.94	-60.94
Propagation cond	ition		1, 2, 3, 4, 5, 6		AWGN	
Antenna Configura			1, 2, 3, 4, 5, 6		1x2 Low	
Correlation Matrix						

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.8.3.1.1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = [50] ms and is specified in TS36.331.

 $T_{interrupt} = [210]$  ms in the test;  $T_{interrupt}$  is defined in TS36.133 clause 5.3.4.3.

This gives a total of [260] ms.

## A.8.4 Measurement procedure

## A.8.4.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay

### A.8.4.1.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay in non-DRX

#### A.8.4.1.1.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 2 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.1.1-1 below. Test parameters and cell-specific parameters for the NR cell are provided in Tables A.8.4.1.1.1-2 and A.8.4.1.1.1-3 below, respectively. Cell-specific parameters for the E-UTRA cell are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1.

Table A.8.4.1.1.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: Th	ne UE is only required to be tested in one of the supported test configurations

Table A.8.4.1.1.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test

Parameter	Unit	Test	Value		Comment
		configuration	Test 1	Test 2	
E-UTRA RF Channel		Config	1		One E-UTRAN TDD carrier
Number		1,2,3,4,5,6		l	frequencies is used.
NR RF Channel		Config	,	1	One NR FR1 carrier frequencies is
Number		1,2,3,4,5,6			used.
Active cell		Config	Ce	II 1	Cell 1 is on E-UTRA RF channel
		1,2,3,4,5,6			number 1.
Neighbour cell		Config	Co	II 2	Cell 2 is on NR RF channel number
		1,2,3,4,5,6		11 2	1.
SMTC-SSB parameters		Config 1,4	SSB.	1 FR1	As specified in clause A.3.10.1
		Config 2,5	SSB.	1 FR1	As specified in clause A.3.10.1
		Config 3,6	SSB.	2 FR1	As specified in clause A.3.10.1
CP length		Config	Normal		Applicable to both cells.
		1,2,3,4,5,6	Normal		
DRX		Config	Ol	==	DRX is not used
		1,2,3,4,5,6	<u> </u>		
Frame time offset	ms	Config 1,2,3,4			Asynchronous cells.
between serving and			3	7	The timing of Cell 2 relative to the
neighbour cells					timing of Cell 1.
	μs	Config 5,6	3		Synchronous cells.
SFN offset between		Config			SFN of Cell 2 relative to SFN of
serving and neighbour		1,2,3,4,5,6	0	1	Cell 1.
cells		.,_,0, .,0,0	· ·	•	
T1	S	Config			
		1,2,3,4,5,6	,	I	

Table A.8.4.1.1.1-3: Cell specific test parameters for Cell 2 in inter-RAT SFTD measurement delay test

Parameter	Unit	Test configuration	Cell 2
NR RF Channel Number		Config 1,2,3,4,5,6	1
Duplex mode		Config 1,4	FDD
Duplex filode		Config 2,3,5,6	TDD
		Config 1,4	10: $N_{RB,c} = 52$
BW <sub>channel</sub>	MHz	Config 2,5	10: $N_{RB,c} = 52$
		Config 3,6	40: N <sub>RB,c</sub> = 106
TDD configuration		Config 2,5	TDDConf.1.1
		Config 3,6	TDDConf.2.1
OCNG Pattern defined in A.3.2.1.1		Config 1,2,3,4,5,6	OP.1
SMTC configuration defined		Config 1,4	SMTC.2
in A.3.2.11.1 and A.3.2.11.2		Config 2,3,5,6	SMTC.1
PDSCH/PDCCH subcarrier	kHz	Config 1,2,4,5	15
spacing	KΠZ	Config 3,6	30
EPRE ratio of PSS to SSS	dB		
EPRE ratio of PBCH DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH DMRS	dB	Config 1,2,3,4,5,6	0
EPRE ratio of OCNG DMRS to SSS Note 1	dB		
EPRE ratio of OCNG to OCNG DMRS Note 1	dB		
N <sub>oc</sub> Note2	dBm/15kHz		-98
N <sub>oc</sub> Note2	dD/CCC	Config 1,2,4,5	-98
Noc	dBm/SCS	Config 3,6	-95
SS-RSRP Note 3, 4	dBm/SCS	Config 1,2,4,5	-94
33-K3KP	ubiii/SCS	Config 3,6	-91
Ê <sub>s</sub> /I <sub>ot</sub>	dB	Config 1,2,3,4,5,6	4
Ês/Noc	dB	Config 1,2,3,4,5,6	4
lo Note 3	dBm/9.36MHz	Config 1,2,4,5	-67.11
10 11010	dBm/38.16MHz	Config 3,6	-62.27
Propagation Condition		Config 1,2,3,4,5,6	AWGN

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## A.8.4.1.1.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at  $T_{RRC\_procedure\_delay} + T_{measure\_SFTD1}$  after the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTI<sub>DCCH</sub> longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

### A.8.4.1.2 E-UTRA – NR Inter-RAT SFTD Measurement Delay in DRX

#### A.8.4.1.2.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 2 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.2.1-1 below. Test parameters are provided in Tables A.8.4.1.2.1-2 below. Cell-specific parameters for the E-UTRA and NR cells are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1, and Table A.8.4.1.1.1-3 in clause A.8.4.1.1.1, respectively.

Table A.8.4.1.2.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: Th	e UE is only required to be tested in one of the supported test configurations

Table A.8.4.1.2.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX

Parameter	Unit	Test	Value		Comment	
		configuration	Test 1	Test 2		
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.	
NR RF Channel Number		Config 1,2,3,4,5,6	1		One NR FR1 carrier frequencies is used.	
Active cell		Config 1,2,3,4,5,6	Cell 1		Cell 1 is on E-UTRA RF channel number 1.	
Neighbour cell		Config 1,2,3,4,5,6	Cell 2		Cell 2 is on NR RF channel number 1.	
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1	
	Config 2,5 SSB.1 FR1 Config 3,6 SSB.2 FR1		1 FR1	As specified in clause A.3.10.1		
			2 FR1	As specified in clause A.3.10.1		
CP length		Config 1,2,3,4,5,6	Normal		Applicable to both cells.	
DRX		Config 1,2,3,4,5,6	DRX.4		DRX configuration as specified in clause A.3.3.4	
Frame time offset between serving and neighbour cells	ms	Config 1,2,3,4	3	7	Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1.	
	μs	Config 5,6	3		Synchronous cells.	
SFN offset between serving and neighbour cells		Config 1,2,3,4,5,6	0	1	SFN of Cell 2 relative to SFN of Cell 1.	
T1	S	Config 1,2,3,4,5,6		1		

## A.8.4.1.2.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at the earliest DRX activity time following upon  $T_{RRC\_procedure\_delay} + T_{measure\_SFTD1}$  from the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTI<sub>DCCH</sub> longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2 E-UTRA – NR Inter-RAT Measurements

## A.8.4.2.1 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.8.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.1.1-1, A.8.4.2.1.1-2, A.8.4.2.1.1-3 and A.8.4.2.1.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.1.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

Configuration	Description				
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1: The UE is only	required to be tested in one of the supported test configurations.				

Table A.8.4.2.1.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value		Comment	
		configurati on	Test 1	Test 2		
RF Channel Numbers		1, 2, 3, 4, 5, 6	2		One LTE and one FR1 NR carrier frequencies are used.	
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)		E-UTRA cell 1 is on E-UTRA RF channe number 1.	
Neighbour cell		1, 2, 3, 4, 5,	NR cell 2		NR cell 2 is on NR RF channel number 1.	
Gap Pattern Id		1, 2, 3, 4, 5, 6	0 4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].	
Measurement gap offset		1, 2, 3, 4, 5, 6	39	19	As specified in TS 36.331 [16].	
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1		E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]	
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]	
Hysteresis	dB	1, 2, 3, 4, 5, 6	0			
CP length		1, 2, 3, 4, 5, 6	Normal			
TimeToTrigger	s	1, 2, 3, 4, 5,	0			
Filter coefficient		1, 2, 3, 4, 5,	0		L3 filtering is not used	
DRX		1, 2, 3, 4, 5, 6	OFF		DRX is not used	
Time offset between serving and neighbour cells		1, 4	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.	
		2, 3, 5, 6	3µs		Synchronous cells.	
T1	S	1, 2, 3, 4, 5, 6	5			
T2	S	1, 2, 3, 4, 5, 6	1	1		

Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.1.1-3

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.1.1-4

Table A.8.4.2.1.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell 1		
			T1	T2	
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1		
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> = 25 10 MHz: N <sub>RB,c</sub> = 50 20 MHz: N <sub>RB,c</sub> = 100		
PDSCH parameters:	5: 1, 2, 3 5 MHz: R.7 FDD 10 MHz: R.3 FDD				

		1		0.555		
DL Reference Measurement			20 MHz: R.6 FDD			
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.			
			10 MHz: R			
			20 MHz: R			
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.			
parameters:			10 MHz: R.6 FDD			
DL Reference Measurement			20 MHz: R.			
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.			
			10 MHz: R			
N. a			20 MHz: R.			
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP			
			10 MHz: OP.10 FDD			
			20 MHz: OP.17 FDD 5 MHz: OP.9 TDD			
		4, 5, 6				
			10 MHz: OP.1 TDD			
			20 MHz: OP.7 TDD			
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79			
PBCH_RA		1, 2, 3, 4, 5, 6				
PBCH_RB						
PSS_RA						
SSS_RA						
PCFICH_RB						
PHICH_RA						
PHICH_RB	dB		0			
PDCCH_RA						
PDCCH_RB						
PDSCH_RA						
PDSCH RB						
OCNG RA <sup>Note3</sup>						
OCNG RB <sup>Note3</sup>						
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	1		
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	17		
Ê <sub>s</sub> /I <sub>ot</sub> Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17		
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87		
SCH_RP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87		
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50)			
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU	,		
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Low			
Correlation Matrix Note6						

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.1.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Ce	II 2
		configuration	T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FC	)D
·		2, 3, 5, 6	TC	)D
TDD configuration		2, 5	TDDC	onf.1.1
Ç		3, 6	TDDC	onf.2.1
BWchannel	MHz	1, 2, 4, 5	10: N <sub>RE</sub>	3,c = 52
		3, 6	40: N <sub>RB</sub>	,c = 106
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6	OF	
SMTC configuration defined in A.3.11.1		1, 4	SMT	C.2
and A.3.11.2		2, 3, 5, 6	SMT	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	1	
. 200 20011 oddodinor opdoling	10.12	3. 6	3	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5		
		3, 6		)6
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6		-
EPRE ratio of PBCH DMRS to SSS		., _, o, ., o, o		
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS			(	)
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-9	18
Note2	dBm/SCS	1, 2, 4, 5	_c	18
N oc Note2	GB111/000	3, 6	-9	-
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91
		3, 6	-Infinity	-88
$\hat{E}_{s}/\mathrm{I}_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
$\hat{\mathcal{E}}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
IoNote3	dBm/9.36MHz	1 2 1 5	Infinity	-65.38
IU ····		1, 2, 4, 5 3, 6	-Infinity	
	dBm/38.16MH	3, 0	-Infinity	-61.06
Propagation Condition	Z	1, 2, 3, 4, 5, 6	ETU	170
Antenna Configuration and Correlation		1, 2, 3, 4, 5, 6	1x2	
Matrix		1, 2, 3, 4, 5, 6	IXZ	LUW
Note 1: OCNG shall be used such that the	coll is fully alloca	ted and a constant	total transmitted r	ower enectral

- Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{max}$  to be fulfilled.
- Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.8.4.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.2 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

#### A.8.4.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.2.1-1, A.8.4.2.2.1-2, A.8.4.2.2.1-3 and A.8.4.2.2.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.2.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.2.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

Configur	ration Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The	UE is only required to be tested in one of the supported test configurations.

Table A.8.4.2.2.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value			Comment	
		configuratio n	Test 1	Test 2	Test 2	Test 4	
RF Channel		1, 2, 3, 4, 5,	2				One LTE and 1 FR1 NR carrier
Number		6					frequencies are used.
Active cell		1, 2, 3, 4, 5, 6	E-UTR	A cell 1 (Po	Cell)		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell	2			NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [16].
b2-Threshold1	dB m	1, 2, 3, 4, 5, 6	Note 1				E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]
b2-Threshold2NR	dB m	1, 2, 3, 4, 5, 6	Note 2				SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0	0			
CP length		1, 2, 3, 4, 5, 6	Normal				
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0				
Filter coefficient		1, 2, 3, 4, 5, 6	0				L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	DRX. 9	DRX.10	DRX. 9	DRX.10	As specified in clause A.3.3
Time offset between serving and neighbour		1, 4	3ms		ı	,	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
cells		2, 3, 5, 6	3μs				Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5				
T2	S	1, 2, 3, 4, 5, 6	2	11	2	11	
		Threshold1 is de Threshold2NR i				1-4	

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.2.1-4

Table A.8.4.2.2.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell	1		
			T1	T2		
RF channel number		1, 2, 3, 4, 5, 6	1			
Duplex mode		1, 2, 3	FDD			
		4, 5, 6	TDD			
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6			
TDD uplink-downlink configuration Note1		4, 5, 6	1			
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	10 MHz: N <sub>F</sub>	5 MHz: N <sub>RB,c</sub> = 25 10 MHz: N <sub>RB,c</sub> = 50 20 MHz: N <sub>RB,c</sub> = 100		
PDSCH parameters:		1, 2, 3	5 MHz: R.	5 MHz: R.7 FDD		

DL Reference Measurement Channel \text{Note2}   A, 5, 6   5 MHz: R.4 TDD	DI Defense Messenses		ı	40 MH = D	0.500			
PCFICH/PDCCH/PHICH   1, 2, 3   5 MHz: R.1 TDD   10 MHz: R.3 TDD   20 MHz: R.3 TDD   20 MHz: R.3 TDD   20 MHz: R.3 TDD   20 MHz: R.1 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 TDD   20 MHz	DL Reference Measurement			10 MHz: R.3 FDD				
10 MHz: R.0 TDD	Channel		4.5.0	_				
CFICH/PDCCH/PHICH   Parameters:			4, 5, 6	- · · · · · · · · · · · · · · · · · · ·				
PCFICH/PDCCH/PHICH parameters:								
Data	POFICI I/PPOCI I/PLUCI		4.0.0					
DL Reference Measurement Channe Note2			1, 2, 3					
ChannelNote2         4, 5, 6         5 MHz; R.11 TDD 10 MHz; R.6 TDD 20 MHz; R.10 TDD 20 MHz; R.10 TDD 10 MHz; R.10 TDD 10 MHz; OP.20 FDD 110 MHz; OP.10 FDD 20 MHz; OP.10 FDD 20 MHz; OP.17 FDD 110 MHz; OP.17 FDD 10 MHz; OP.17 FDD 10 MHz; OP.17 FDD 10 MHz; OP.17 FDD 10 MHz; OP.17 FDD 10 MHz; OP.7 TDD 10	•							
10 MHz: R.6 TDD   20 MHz: R.10 TDD			4.5.0					
CCNG PatternsNote2	Channel		4, 5, 6					
DCNG PatternsNote2								
10 MHz: OP.10 FDD 20 MHz: OP.17 FDD 20 MHz: OP.17 FDD 10 MHz: OP.17 FDD 10 MHz: OP.17 FDD 10 MHz: OP.17 FDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TD	OCNO Dette as a Note?		4.0.0					
Community	OCNG Patterns <sup>Note2</sup>		1, 2, 3					
A, 5, 6   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7 TDD   20								
D2-Threshold1			1 5 6					
Description			4, 5, 6					
D2-Threshold1								
PBCH_RA	h2-Threshold1	dBm	123456					
PBCH_RB		QDIII		13				
PSS_RA   SSS_RA   PCFICH_RB   PHICH_RA   PHICH_RB   O   PDCCH_RA   PDCCH_RA   PDCCH_RB   PDSCH_RA   PDSCH_RB   O   POCKH_RB	_	_	1, 2, 0, 4, 0, 0					
SSS_RA		_						
PCFICH_RB         PHICH_RA           PHICH_RB         dB           PDCCH_RA         0           PDCCH_RB         0           PDSCH_RB         0           PDSCH_RB         0           OCNG_RANote3         0           OCNG_RBNote3         0           NocNote4         dBm/15kHz         1, 2, 3, 4, 5, 6         -1nfinity           És/Noc         dB         1, 2, 3, 4, 5, 6         -Infinity         17           Es/lolNote5         dB         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           JoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         ETU70		_						
PHICH_RA								
PHICH_RB         dB         0           PDCCH_RA         PDCCH_RB         0           PDSCH_RB         PDSCH_RB         0           OCNG_RANote3         0         0           OCNG_RBNote3         0         0           Noc_Note4         dB 1, 2, 3, 4, 5, 6         -104           Ès/Noc         dB 1, 2, 3, 4, 5, 6         -Infinity 17           RSRPNote5         dB 1, 2, 3, 4, 5, 6         -Infinity 9         -87           SCH_RPNote5         dBm/15kHz 1, 2, 3, 4, 5, 6         -Infinity 9         -87           SCH_RPNote5         dBm/15kHz 1, 2, 3, 4, 5, 6         -Infinity 9         -87           SCH_RPNote5         dBm/15kHz 1, 2, 3, 4, 5, 6         -Infinity 9         -87           IoNote5         dBm/9MHz 1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50) 9         -59.13+10log (N <sub>RB,c</sub> /50) /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         ETU70		_						
PDCCH_RB PDSCH_RA PDSCH_RB OCNG_RANote3 OCNG_RBNote3 Noc^Note4 Es/Noc dB 1, 2, 3, 4, 5, 6 -Infinity 17 Es/Iot^Note5 dB 1, 2, 3, 4, 5, 6 -Infinity 17 RSRPNote5 dBm/15kHz 1, 2, 3, 4, 5, 6 -Infinity 17 SCH_RPNote5 dBm/15kHz 1, 2, 3, 4, 5, 6 -Infinity -87 SCH_RPNote5 dBm/15kHz 1, 2, 3, 4, 5, 6 -Infinity -87 SCH_RPNote5 dBm/9MHz 1, 2, 3, 4, 5, 6 -Infinity -87 Io^Note5 dBm/9MHz 1, 2, 3, 4, 5, 6 -76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50) Propagation Condition Note6 Antenna Configuration and 1, 2, 3, 4, 5, 6 ETU70		dB		0				
PDCCH_RB				0				
PDSCH_RA PDSCH_RB  OCNG_RA <sup>Note3</sup> OCNG_RB <sup>Note3</sup> Noc <sup>Note4</sup> Es/Noc  dB 1, 2, 3, 4, 5, 6 -Infinity 17  Es/Ior <sup>Note5</sup> dB 1, 2, 3, 4, 5, 6 -Infinity 17  RSRP <sup>Note5</sup> dB 1, 2, 3, 4, 5, 6 -Infinity 17  RSRPNote5  dBm/15kHz 1, 2, 3, 4, 5, 6 -Infinity -87  SCH_RP <sup>Note5</sup> dBm/15kHz 1, 2, 3, 4, 5, 6 -Infinity -87  SCH_RP <sup>Note5</sup> dBm/9MHz 1, 2, 3, 4, 5, 6 -76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50)  Propagation Condition Note6  Antenna Configuration and 1, 2, 3, 4, 5, 6 1x2 Low	_							
PDSCH_RB           OCNG_RANote3           OCNG_RBNote3           NocNote4         dBm/15kHz         1, 2, 3, 4, 5, 6         -104           Ê₅/Noc         dB         1, 2, 3, 4, 5, 6         -Infinity         17           Ê₅/IorNote5         dB         1, 2, 3, 4, 5, 6         -Infinity         17           RSRPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           IoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low	_							
OCNG_RANote3         OCNG_RBNote3           NocNote4         dBm/15kHz         1, 2, 3, 4, 5, 6         -104           Ēs/Noc         dB         1, 2, 3, 4, 5, 6         -Infinity         17           Ēs/IotNote5         dB         1, 2, 3, 4, 5, 6         -Infinity         17           RSRPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           IoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low								
OCNG_RBNote3         Image: None Note According to Mone Note According to Mone Note According to Mone Acco								
NocNote4         dBm/15kHz         1, 2, 3, 4, 5, 6         -104           Ês/Noc         dB         1, 2, 3, 4, 5, 6         -Infinity         17           Ēs/Iot <sup>Note5</sup> dB         1, 2, 3, 4, 5, 6         -Infinity         17           RSRPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           IoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		dBm/15kHz	1, 2, 3, 4, 5, 6	-104	1			
És/Iot <sup>Note5</sup> dB         1, 2, 3, 4, 5, 6         -Infinity         17           RSRP <sup>Note5</sup> dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RP <sup>Note5</sup> dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           Io <sup>Note5</sup> dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low	^							
RSRPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           IoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low				-				
SCH_RPNote5         dBm/15kHz         1, 2, 3, 4, 5, 6         -Infinity         -87           IoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low								
IoNote5         dBm/9MHz         1, 2, 3, 4, 5, 6         -76.22+10log (N <sub>RB,c</sub> /50)         -59.13+10log (N <sub>RB,c</sub> /50)           Propagation Condition Note6         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and         1, 2, 3, 4, 5, 6         1x2 Low				-				
Propagation Condition Note61, 2, 3, 4, 5, 6ETU70Antenna Configuration and1, 2, 3, 4, 5, 61x2 Low	_			-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub>				
Antenna Configuration and 1, 2, 3, 4, 5, 6 1x2 Low	Propagation Condition Note6		123456	FTII	,			
	Antenna Configuration and							
			1, 2, 0, 4, 0, 0	TAZ L	<b>~</b>			

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.2.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter Unit Test Cell 2					
		configuration	T1	T2	
NR RF Channel Number		1, 2, 3, 4, 5, 6		1	
Duplex mode		1, 4	FDD		
·		2, 3, 5, 6	TI	DD	
TDD configuration		2, 5	TDDConf.1.1		
•		3, 6	TDDC	onf.2.1	
BW <sub>channel</sub>	MHz	1, 2, 4, 5	10: N <sub>RB,c</sub> = 52		
		3, 6	40: N <sub>RB,c</sub> = 106		
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6		P.1	
SMTC configuration defined in A.3.11.1		1, 4	SM	TC.2	
and A.3.11.2		2, 3, 5, 6	SM	TC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	1	15	
, ,		3, 6	3	30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-99		
		3, 6	-96		
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS			0		
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS (Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-!	98	
N oc Note2	dBm/SCS	1, 2, 4, 5	-:	98	
oc oc		3, 6	-!	95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91	
		3, 6	-Infinity	-88	
$\mathbf{\hat{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
$\hat{E}_{s}/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
Io <sup>Note3</sup>	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38	
	dBm/38.16MH	3, 6	-Infinity	-61.06	
Propagation Condition	Z	1, 2, 3, 4, 5, 6		U70	
Antenna Configuration and Correlation		1, 2, 3, 4, 5, 6		Low	
Matrix		, , , , ,			
Note 1: OCNG shall be used such that the		ted and a constant	total transmitted	power spectral	

density is achieved for all OFDM symbols.

#### A.8.4.2.2.2 **Test Requirements**

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not Note 3: settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.3 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

#### A.8.4.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.3.1-1, A.8.4.2.3.1-2, A.8.4.2.3.1-3 and A.8.4.2.3.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.3.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is onl	v required to be tested in one of the supported test configurations.

Table A.8.4.2.3.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
RF Channel Numbers		1, 2, 3, 4, 5,		2	One LTE and one FR1 NR carrier
		6			frequencies are used.
Active cell		1, 2, 3, 4, 5,	E-UTRA ce	ll 1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel
		6			number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39	19	As specified in TS 36.331 [16].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1		E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0		
CP length		1, 2, 3, 4, 5, 6	Normal		
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0		
Filter coefficient		1, 2, 3, 4, 5, 6	0		L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	OFF		DRX is not used
Time offset between serving and neighbour cells		1, 4	3ms		Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs		Synchronous cells.
T1	S	1, 2, 3, 4, 5, 6	5		
T2	S	1, 2, 3, 4, 5, 6	2	1	

Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.3.1-3

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.3.1-4

Table A.8.4.2.3.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell	1		
			T1	T2		
RF channel number		1, 2, 3, 4, 5, 6	1			
Duplex mode		1, 2, 3	FDD			
		4, 5, 6	TDD			
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1	1		
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	10 MHz: N <sub>F</sub>	5 MHz: N <sub>RB,c</sub> = 25 10 MHz: N <sub>RB,c</sub> = 50 20 MHz: N <sub>RB,c</sub> = 100		
PDSCH parameters:		1, 2, 3		5 MHz: R.7 FDD		

DL Reference Measurement						
Channel <sup>Note2</sup>			20 MHz: R.6 FDD			
		4, 5, 6	5 MHz: R.	4 TDD		
			10 MHz: R	.0 TDD		
			20 MHz: R	.3 TDD		
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.	11 FDD		
parameters:		, ,	10 MHz: R.6 FDD			
DL Reference Measurement			20 MHz: R.			
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.	11 TDD		
		, ,	10 MHz: R	.6 TDD		
			20 MHz: R.	10 TDD		
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP	.20 FDD		
		, ,	10 MHz: OP.10 FDD			
			20 MHz: OP	.17 FDD		
		4, 5, 6	5 MHz: OP.9 TDD			
		, ,	10 MHz: OP.1 TDD			
			20 MHz: OP.7 TDD			
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79			
PBCH_RA		1, 2, 3, 4, 5, 6				
PBCH_RB						
PSS_RA						
SSS_RA						
PCFICH_RB						
PHICH_RA						
PHICH_RB	dB		0			
PDCCH_RA						
PDCCH_RB						
PDSCH_RA						
PDSCH RB						
OCNG_RA <sup>Note3</sup>						
OCNG RB <sup>Note3</sup>						
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	1		
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	17		
Ê <sub>s</sub> /I <sub>ot</sub> Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17		
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87		
SCH RP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87		
	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub>			
Io <sup>Note5</sup>	dBiii, oivii i2	1, 2, 0, 1, 0, 0	/50)			
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU7	70		
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Low			
Correlation Matrix Note6						

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.

Note 5: Ês/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.3.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 2		
		configuration	T1	T2	
NR RF Channel Number		1, 2, 3, 4, 5, 6		1	
Duplex mode		1, 4		DD	
·		2, 3, 5, 6	TI	DD	
TDD configuration		2, 5	TDDC	onf.1.1	
		3, 6	TDDC	onf.2.1	
BW <sub>channel</sub>	MHz	1, 2, 4, 5		в,с = 52	
		3, 6	40: N <sub>RE</sub>	s,c = 106	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6	O	P.1	
SMTC configuration defined in A.3.11.1		1, 4	SM <sup>*</sup>	TC.2	
and A.3.11.2		2, 3, 5, 6	SM	TC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5		5	
3		3, 6		30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-99		
		3, 6	-96		
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS				0	
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS (Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
IV oc	dBm/15kHz	1, 2, 3, 4, 5, 6	-(	98	
Note2	dBm/SCS	1, 2, 4, 5		98	
		3, 6		95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91	
		3, 6	-Infinity	-88	
$\mathbf{\hat{E}_{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
$\hat{E}_{s}/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
Io <sup>Note3</sup>	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38	
	dBm/38.16MH	1, 2, 4, 5 3, 6	-Infinity	-61.06	
Propagation Condition		1, 2, 3, 4, 5, 6	ET	U70	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6		Low	

- Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{max}$  to be fulfilled.
- Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.8.4.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.4 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

#### A.8.4.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.4.1-1, A.8.4.2.4.1-2, A.8.4.2.4.1-3 and A.8.4.2.4.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.4.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only re	equired to be tested in one of the supported test configurations.

Table A.8.4.2.4.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value				Comment	
		configuratio n	Test 1	Test 2	Test 2	Test 4		
RF Channel		1, 2, 3, 4, 5,	2				One LTE and 1 FR1 NR carrier	
Number		6					frequencies are used.	
Active cell		1, 2, 3, 4, 5, 6	E-UTR/	A cell 1 (PC	Cell)		E-UTRA cell 1 is on E-UTRA RF channel number 1.	
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell	2			NR cell 2 is on NR RF channel number 1.	
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].	
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [16].	
b2-Threshold1	dB m	1, 2, 3, 4, 5, 6	Note 1				E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]	
b2-Threshold2NR	dB m	1, 2, 3, 4, 5, 6	Note 2				SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]	
Hysteresis	dB	1, 2, 3, 4, 5, 6	0					
CP length		1, 2, 3, 4, 5, 6	Normal					
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0					
Filter coefficient		1, 2, 3, 4, 5, 6	0				L3 filtering is not used	
DRX		1, 2, 3, 4, 5, 6	DRX. 9	DRX.10	DRX. 9	DRX.10	As specified in clause A.3.3	
Time offset between serving and neighbour		1, 4	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.	
cells		2, 3, 5, 6	3μs				Synchronous cells.	
T1	S	1, 2, 3, 4, 5, 6	5					
T2	S	1, 2, 3, 4, 5, 6	2	13	2	13		
Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.4.1-3  Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.4.1-4								

Table A.8.4.2.4.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell 1			
			T1	T2		
RF channel number		1, 2, 3, 4, 5, 6	1			
Duplex mode		1, 2, 3	FDD			
		4, 5, 6	TDD			
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6			
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1			
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c} = 25$ 10 MHz: $N_{RB,c} = 50$ 20 MHz: $N_{RB,c} = 100$			
PDSCH parameters:		1, 2, 3	5 MHz: R.7	FDD		

DL Reference Measurement			10 MHz: R	.3 FDD			
Channel <sup>Note2</sup>			20 MHz: R	.6 FDD			
		4, 5, 6	5 MHz: R.	4 TDD			
			10 MHz: R	.0 TDD			
			20 MHz: R.3 TDD				
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.	11 FDD			
parameters:		, ,	10 MHz: R.6 FDD				
DL Reference Measurement			20 MHz: R.				
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.	11 TDD			
		, ,	10 MHz: R	.6 TDD			
			20 MHz: R.	10 TDD			
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP	.20 FDD			
		, ,	10 MHz: OP	2.10 FDD			
			20 MHz: OP	.17 FDD			
		4, 5, 6	5 MHz: OP				
		, ,	10 MHz: OF	P.1 TDD			
			20 MHz: OP.7 TDD				
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79				
PBCH_RA		1, 2, 3, 4, 5, 6					
PBCH_RB							
PSS_RA							
SSS_RA							
PCFICH_RB							
PHICH_RA							
PHICH_RB	dB		0				
PDCCH_RA							
PDCCH_RB							
PDSCH_RA							
PDSCH RB							
OCNG_RA <sup>Note3</sup>							
OCNG RB <sup>Note3</sup>							
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	1			
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity 17				
Ê <sub>s</sub> /I <sub>ot</sub> Note5	dB	1, 2, 3, 4, 5, 6	-Infinity 17				
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity 17				
SCH RP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87			
	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub>				
Io <sup>Note5</sup>	35, 5 12	., 2, 0, 1, 0, 0	/50)				
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU7	70			
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Low				
Correlation Matrix Note6							

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.

Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.4.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 2		
		configuration	T1	T2	
NR RF Channel Number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 4	FD	)D	
•		2, 3, 5, 6	TDD		
TDD configuration		2, 5	TDDC	onf.1.1	
· ·		3, 6	TDDC	onf.2.1	
BW <sub>channel</sub>	MHz	1, 2, 4, 5	10: N <sub>R</sub>	s,c = 52	
		3, 6	40: N <sub>RB</sub>	,c = 106	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6	OF		
SMTC configuration defined in A.3.11.1		1, 4	SMT	C.2	
and A.3.11.2		2, 3, 5, 6	SMT	C.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	1		
. 3		3, 6	3		
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-9	19	
		3, 6	-9	16	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS			0		
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS (Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-9	8	
Note2	dBm/SCS	1, 2, 4, 5	_ç	18	
N oc Note2	u2, 000	3, 6		)5	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91	
		3, 6	-Infinity	-88	
$\hat{\mathbf{E}}_{_{\mathrm{s}}}/\mathbf{I}_{_{\mathrm{ot}}}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
$\hat{E}_{s}/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
Io <sup>Note3</sup>	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38	
	dBm/38.16MH	3, 6	-Infinity	-61.06	
	Z				
Propagation Condition		1, 2, 3, 4, 5, 6	ETI	J70	
Antenna Configuration and Correlation		1, 2, 3, 4, 5, 6	1x2 Low		
Matrix  Note 1: OCNG shall be used such that the	<u> </u>				

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

## A.8.4.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $_{N_{oc}}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.5 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used

#### A.8.4.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.5.1-1, A.8.4.2.5.1-2 and A.8.4.2.5.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.5.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

Table A.8.4.2.5.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in non-DRX

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only re	equired to be tested in one of the supported test configurations.

Table A.8.4.2.5.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Parameter	Unit	Test	Va	lue	Comment
		configurati on	Test 1	Test 2	
RF Channel Numbers		1, 2	2		One LTE and one FR2 NR carrier frequencies are used.
Active cell		1, 2	E-UTRA cel	I 1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2	39	19	As specified in TS 36.331 [16].
b1-ThresholdNR	dBm	1, 2	Note 1		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2	0		
CP length		1, 2	Normal		
TimeToTrigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	OFF		DRX is not used
Time offset between serving and neighbour cells		1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3µs		Synchronous cells.
T1	s	1, 2	10		
T2	s	1, 2	6	3	
Note 1: The value of b	o1-Thres	holdNR is defin	ed in Table A.	8.4.2.5.1-3	

Table A.8.4.2.5.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Parameter	Unit	Test	С	ell 2
		configuration	T1	T2
NR RF Channel Number		1, 2		1
Duplex mode		1, 2		DD
TDD configuration		1, 2		Conf.3.1
BW <sub>channel</sub>	MHz	1, 2		$I_{RB,c} = 66$
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	C	P.1
SMTC configuration defined in A.3.11.1		1	SM	ITC.2
and A.3.11.2		2	SM	ITC.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	,	120
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-	108
EPRE ratio of PSS to SSS		1, 2		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
AoA setup defined in A.3.15.2.1		1, 2		up 2a
N Note2	dBm/15kHz	1, 2	-111	
N Note2	dBm/SCS	1, 2	-	102
SS-RSRP Note 3	dBm/SCS	1, 2 1, 2	-Infinity	-88
$\hat{\mathbf{E}}_{\!\scriptscriptstyle{\mathrm{s}}}/\mathbf{I}_{\!\scriptscriptstyle{\mathrm{ot}}}$	dB	1, 2	-Infinity	14
$\hat{E}_{s}/N_{oc}$	dB	1, 2	-Infinity	14
Io <sup>Note3</sup>	dBm/95.04MH z	1, 2	-Infinity	-58.84
Propagation Condition	<u> </u>	1, 2	Α\	VGN

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.8.4.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N to be fulfilled.

In test 1 and test 2, the UE is not required to report SSB time index.

Table A.8.4.2.5.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Test case	Measurement reporting delay (ms)						
	Test 1: D1 ms Test 2: D2 ms						
UE power class 3	3200	1600					

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.6 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used

#### A.8.4.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.6.1-1, A.8.4.2.6.1-2 and A.8.4.2.6.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.6.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.6.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

Table A.8.4.2.6.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX

Configuration	Description					
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
Note 1: The UE is only required to be tested in one of the supported test configurations.						

Table A.8.4.2.6.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test		Value			Comment
		configuratio n	Test 1	Test 2	Test 3	Test 4	
RF Channel Number		1, 2	2				One LTE and 1 FR2 NR carrier frequencies are used.
Active cell		1, 2, 3, 4, 5, 6	E-UTR/	A cell 1 (PC	Cell)		E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell	2			NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [16].
b1-ThresholdNR	dB m	1, 2	Note 1				SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0				
CP length		1, 2, 3, 4, 5, 6	Normal				
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0				
Filter coefficient		1, 2, 3, 4, 5, 6	0				L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	DRX. 9	DRX.10	DRX. 9	DRX.10	As specified in clause A.3.3
Time offset between serving and neighbour		1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
cells		2	3μs				Synchronous cells.
T1	S	1, 2, 3, 4, 5, 6	5				
T2	S	1, 2, 3, 4, 5, 6	6	83	6	83	
Note 1: The value	e of b1-	ThresholdNR is	defined i	n Table A.	8.4.2.5.1	-3	

Table A.8.4.2.6.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test	C	ell 2
		configuration	T1	T2
NR RF Channel Number		1, 2		1
Duplex mode		1, 2	٦	ΓDD
TDD configuration		1, 2	TDD	Conf.3.1
BW <sub>channel</sub>	MHz	1, 2	100: N	$N_{RB,c} = 66$
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	C	DP.1
SMTC configuration defined in A.3.11.1		1	SN	/ITC.2
and A.3.11.2		2	SN	/ITC.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2		120
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2		-96
EPRE ratio of PSS to SSS		1, 2		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)		4.0		
AoA setup defined in A.3.15.1	JD /4 EL-L	1, 2		etup 1
N oc	dBm/15kHz	1, 2	-111	
N Note2	dBm/SCS	1, 2	-102	
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88
$\hat{\mathbf{E}}_{\!\scriptscriptstyle k}/\mathbf{I}_{\!\scriptscriptstyle \mathrm{ot}}$	dB	1, 2	-Infinity	14
$\hat{E}_{s}/N_{oc}$	dB	1, 2	-Infinity	14
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84
	z			
Propagation Condition		1, 2	A۱	WGN

- Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $_N$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## A.8.4.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

Table A.8.4.2.6.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Test case	Measurement reporting delay (ms)					
	Test 1: D1 ms Test 2: D2 ms Test 3: D3 ms Test 4: D4 ms					
UE power class 3	4800	51200	4800	51200		

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.7 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used

#### A.8.4.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.7.1-1, A.8.4.2.7.1-2 and A.8.4.2.7.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.7.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.7.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.7.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in non-DRX

Coi	nfiguration	Description			
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note 1:	The UE is only re	is only required to be tested in one of the supported test configurations.			

Table A.8.4.2.7.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
RF Channel Numbers		1, 2	2		One LTE and one FR2 NR carrier frequencies are used.
Active cell		1, 2	E-UTRA cel	I 1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2	39	19	As specified in TS 36.331 [16].
b1-ThresholdNR	dBm	1, 2	Note 1		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2	0		
CP length		1, 2	Normal		
TimeToTrigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	OFF		DRX is not used
Time offset between serving and neighbour cells		1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3µs		Synchronous cells.
T1	s	1, 2	5		
T2	s	1, 2	5	3	
Note 1: The value of b	o1-Thres	holdNR is defin	ed in Table A	.8.4.2.5.1-3	

Table A.8.4.2.7.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Parameter Unit Test		Ce	Cell 2	
		configuration	T1	T2	
NR RF Channel Number		1, 2	1		
Duplex mode		1, 2	·	DD	
TDD configuration		1, 2	TDDC	Conf.3.1	
BW <sub>channel</sub>	MHz	1, 2	100: N	RB,c = 66	
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	0	P.1	
SMTC configuration defined in A.3.11.1		1	SM	TC.2	
and A.3.11.2		2	SM	TC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	1	20	
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-	96	
EPRE ratio of PSS to SSS		1, 2			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS				0	
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS (Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
AoA setup defined in A.3.15.1		1, 2		tup 1	
N oc	dBm/15kHz	1, 2	-1	111	
$N_{oc}^{\text{Note2}}$	dBm/SCS	1, 2		102	
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1, 2	-Infinity	14	
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	14	
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84	
	Z				
Propagation Condition		1, 2	AV	VGN	

- Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## A.8.4.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

Table A.8.4.2.7.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Test case	Measurement reporting delay (ms)			
	Test 1: D1 ms	Test 2: D2 ms		
UE power class 3	4160	2080		

## A.8.4.2.8 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

### A.8.4.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.8.1-1, A.8.4.2.8.1-2 and A.8.4.2.8.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.8.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.8.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.8.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1 in

Configuration Description				
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note 1:	e 1: The UE is only required to be tested in one of the supported test configurations.			

Table A.8.4.2.8.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection in DRX

Parameter	Unit	Test	Value			Comment	
		configuratio	Test	Test 2	Test	Test 4	
		n	1		3		
RF Channel		1, 2		2	2		One LTE and 1 FR1 NR carrier
Number							frequencies are used.
Active cell		1, 2	E-UTR	A cell 1 (PC	Cell)		E-UTRA cell 1 is on E-UTRA RF channel
							number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2	NR cell	2			NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0		4		As specified in clause Table 8.1.2.1-1 of
							TS 36.133 [15].
Measurement		1, 2	39		19		As specified in TS 36.331 [16].
gap offset							
b1-ThresholdNR	dBm	1, 2	Note 1				SS-RSRP threshold for SS-RSRP
							measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2	0				
CP length		1, 2	Normal				
TimeToTrigger	S	1, 2	0				
Filter coefficient		1, 2	0				L3 filtering is not used
DRX			DRX.	DRX.10	DRX.	DRX.10	As specified in clause A.3.3
			9		9		
Time offset		1	3ms				Asynchronous cells.
between serving							The timing of Cell 2 is 3ms later than the
and neighbour							timing of Cell 1.
cells		2	3µs				Synchronous cells.
T1	s	1, 2	5				
T2	S	1, 2	7	70	7	70	
Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.5.1-3							

Table A.8.4.2.8.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection

Parameter	Parameter Unit		Cell 2	
		configuration	T1	T2
NR RF Channel Number		1, 2	1	
Duplex mode		1, 2	TDD	
TDD configuration		1, 2	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	1, 2	100: N	RB,c = 66
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	0	P.1
SMTC configuration defined in A.3.11.1		1	SM	TC.2
and A.3.11.2		2	SM	TC.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	1	20
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-	96
EPRE ratio of PSS to SSS		1, 2		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
AoA setup defined in A.3.15.1		1, 2		tup 1
N oc Note2	dBm/15kHz	1, 2	-1	11
N Note2	dBm/SCS	1, 2	-1	02
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	1, 2	-Infinity	14
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	14
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84
	Z			
Propagation Condition		1, 2	AV	VGN

- Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.8.4.2.8.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

Table A.8.4.2.8.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

Test case	Measurement reporting delay (ms)					
	Test 1: D1 ms Test 2: D2 ms Test 3: D3 ms Test 4: D4 ms					
UE power class 3	6240	66560	6240	66560		

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.5 Measurement performance

## A.8.5.1 SFTD accuracy

## A.8.5.1.1 SFTD accuracy

#### A.8.5.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for inter-RAT FR1 SFTD measurements.

#### A.8.5.1.1.2 Test Environment

Supported test configurations are shown in Table A.8.5.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is inter-RAT NR FR1 target cell. The test parameters of cell 1 are given in clause A.8.5.1.1.2-2. The test parameters of cell 2 are given in Table A.8.5.1.1.2-3. The SFTD between PCell and target cell shall be set by the test equipment to one of the time differences in Table A.8.5.1.1.2-4.

Table A.8.5.1.1.2-1: Supported test configurations for SFTD accuracy

Configuration	Description			
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD			
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD			
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD			
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD			
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD			
6 NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TI				
Note: The UE is o	Note: The UE is only required to be tested in one of the supported test configurations			

Table A.8.5.1.1.2-2: Test parameters for SFTD accuracy (Cell 1)

Parameter	Unit	Test 1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD

TDD anasial subframe configuration Note1		6
TDD special subframe configuration Note1		0
TDD uplink-downlink configuration <sup>Note1</sup>		1 5 MH N 05
BW <sub>channel</sub>		5 MHz: N <sub>RB,c</sub> = 25
		10 MHz: N <sub>RB,c</sub> = 50
		20 MHz: N <sub>RB,c</sub> = 100
PDSCH parameters:		5 MHz: R.7 FDD
DL Reference Measurement Channel Note2		10 MHz: R.3 FDD
		20 MHz: R.6 FDD
		5 MHz: R.4 TDD
		10 MHz: R.0 TDD
		20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters:		5 MHz: R.11 FDD
DL Reference Measurement ChannelNote2		10 MHz: R.6 FDD
		20 MHz: R.10 FDD
		5 MHz: R.11 TDD
		10 MHz: R.6 TDD
		20 MHz: R.10 TDD
OCNG Patterns <sup>Note2</sup>		5 MHz: OP.20 FDD
		10 MHz: OP.10 FDD
		20 MHz: OP.17 FDD
		5 MHz: OP.9 TDD
		10 MHz: OP.1 TDD
		20 MHz: OP.7 TDD
PBCH_RA	dB	
PBCH_RB	dB	]
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	]
PHICH_RB	dB	0
PDCCH_RA	dB	1
PDCCH_RB	dB	
PDSCH_RA	dB	1
PDSCH RB	dB	1
OCNG_RA <sup>Note3</sup>	dB	1
OCNG_RB <sup>Note3</sup>	dB	1
N <sub>oc</sub> Note4	dBm/15 kHz	-104
Ê <sub>s</sub> /N <sub>oc</sub>	dBiii/13 Ki iz	-3
Ê <sub>s</sub> /I <sub>ot</sub>	dB	-3
RSRP Note5	dBm/15 kHz	-107
SCH_RP Note5	dBm/15 kHz	-107
Io Note5	dBm/Ch BW	-74.45
10	UDITI/CIT DVV	-74.45 +10log
		, - , -
Propagation Condition		(N <sub>RB,c</sub> /50)
Propagation Condition		AWGN
Antenna Configuration	- Park and Control	1x2
Note 1: Special subframe and uplink-down	nlink configuration	s are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 5: Es/lot, RSRP, SCH\_RP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.8.5.1.1.2-3: Test parameters for SFTD accuracy (Cell 2)

	Parameter	Config	Unit	Test 1	
SSB GSCN		1~6	J	freq1	
002 000.		1,4		FDD	
Duplex mod	de	2,5	_	TDD	
2 4 10 11 11 10 1		3,6		TDD	
		1,4		N/A	
TDD Config	uration	2,5	†	TDDConf.1.1	
1 DD Coming	jaration	3,6		TDDConf.2.1	
		1,4		10: N <sub>RB,c</sub> = 52	
BW <sub>channel</sub>		2,5	MHz	10: N <sub>RB,c</sub> = 52	
D V V channel		3,6	1711 12	40: N <sub>RB,c</sub> = 32	
		1,4		SR.1.1 FDD	
PDSCH Re	ference measurement	2,5		SR.1.1 TDD	
channel		3,6		SR.2.1 TDD	
		1,4		CR.1.1 FDD	
DMCI COD	ESET Reference Channel	2,5	1	CR.1.1 TDD	
KIVISI COK	ESET Reference Charmer		1		
		3,6		CR.2.1 TDD	
DMC COD	ECET Deference Change	1,4	-	CCR.1.1 FDD	
KIVIC CORE	ESET Reference Channel	2,5	=	CCR.1.1 TDD	
		3,6		CCR.2.1 TDD	
000		1,4	-	SSB.1 FR1	
SSB config	uration	2,5	-	SSB.1 FR1	
OMTO		3,6		SSB.2 FR1	
SMTC conf		1~6		SMTC.1	
DL BWP co		1~6		DLBWP.1.1	
UL BWP co		1~6		ULBWP.1.1	
OCNG Patt		1~6		OP.1	
	of PSS to SSS				
	of PBCH DMRS to SSS				
	of PBCH to PBCH DMRS				
	of PDCCH DMRS to SSS				
	of PDCCH to PDCCH				
DMRS				0	
	of PDSCH DMRS to SSS	1~6	dB		
	of PDSCH to PDSCH				
DMRS					
EPRE ratio	of OCNG DMRS to SSS <sup>Note</sup>				
1					
	of OCNG to OCNG DMRS				
Note 1	Lub ebb es :				
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				
	NR_FDD_FR1_B				
	NR_TDD_FR1_C				
$N_{oc}^{ m Note2}$	NR_FDD_FR1_D,	1~6	dBm/15kHz	-104	
ос	NR_TDD_FR1_D				
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				
	NR_FDD_FR1_H				
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				
	NR_FDD_FR1_B	1245			
$N_{oc}^{ m Note2}$	NR_TDD_FR1_C		dBm/SSB SCS	-104	
1 voc	NR_FDD_FR1_D,	1,2,4,5		-104	
	NR_TDD_FR1_D				
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E		1		

	ND EDD ED4 O		I	T
	NR_FDD_FR1_G			
	NR_FDD_FR1_H		-	
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A	3,6		
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D,			-101
	NR_TDD_FR1_D			
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
^ /-	NR_FDD_FR1_H			_
$\hat{\mathbf{E}}_{s}/\mathbf{I}_{ot}$		1~6	dB	-3
$\hat{E}_{s}/N_{oc}$		1~6	dB	-3
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A			
	NR FDD FR1 B			
	NR_TDD_FR1_C			
	NR FDD FR1 D,			
	NR_TDD_FR1_D	1,2,4,5	· dBm/SCS ·	-107
	NR_FDD_FR1_E,			
	NR TDD FR1 E			
SS-RSRP Note3	NR FDD FR1 G			
	NR FDD FR1 H			
	NR_FDD_FR1_A,	3,6		
	NR_TDD_FR1_A			
	NR FDD FR1 B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D,			
	NR_TDD_FR1_D			-104
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR FDD FR1 G			
	NR_FDD_FR1_H			
	NR FDD FR1 A,			
	NR_TDD_FR1_A			
	NR FDD FR1 B			
	NR TDD FR1 C			
	NR_FDD_FR1_D,		dBm/9.36 MHz	
	NR_TDD_FR1_D,	1,2,4,5	ubili/9.30 Minz	-74.28
	NR_FDD_FR1_E,			
	NR TDD FR1 F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
lo Note3				
	NR_FDD_FR1_A, NR_TDD_FR1_A			
	NR_FDD_FR1_B			
	NR_TDD_FR1_C		dPm/20 46	
	NR_FDD_FR1_D,	3,6	dBm/38.16 MHz	-68.18
	NR_TDD_FR1_D		IVITZ	
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
Propagation	NR_FDD_FR1_H	1~6		AWGN
Antenna co		1~6		1x2
AIILEIIIIA CO	ringulation	1~0	1	١٨૮

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference

Table A.8.5.1.1.2-4: Timing offsets for SFTD accuracy test

Configuration	SFN offset between PCell and PSCell	Frame boundary offset between PCell and PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

#### A.8.5.1.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and inter-RAT NR target cell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

# A.8.5.2 E-UTRA – NR Inter-RAT Measurement Performance requirements

### A.8.5.2.1 SS-RSRP

### A.8.5.2.1.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.1 in TS 36.133 [15] for inter-RAT FR1 SS-RSRP measurements.

#### A.8.5.2.1.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.1.1.2-2.

Table A.8.5.2.1.1.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations

Config	Description				
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations					

Table A.8.5.2.1.1.2-2: SS-RSRP inter-RAT test parameters

Parameter		Unit	Tes Cel			st 2		st 3 ell 2
SSB ARFCN			fre			eq1		eq1
Duplex mode	Config 1,4			7-		DD		- 1
Duplex mode	Config 2,3,5,6					DD		
	Config 1,4				Not Ap	plicable		
TDD configuration	Config 2,5				TDDC	Conf.1.1		
	Config 3,6				TDDC	Conf.2.1		
Downlink initial BWP cor	nfiguration				DLB\	NP.0.1		
Downlink dedicated BWI						NP.1.1		
Uplink initial BWP config	uration				ULB\	NP.0.1		
Uplink dedicated BWP c	onfiguration				ULB\	NP.1.1		
DRX Cycle configuration	1	ms			Not Ap	plicable		
	Config 1,4				TRS.1	I.1 FDD		
TRS configuration	Config 2,5				TRS.1	I.1 TDD		
	Config 3,6				TRS.1	1.2 TDD		
	Config 1,4							
PDSCH Reference measurement channel	Config 2,5		-		-		-	
	Config 3,6							
	Config 1,4							
RMSI CORESET Reference Channel	Config 2,5		-			-		-
	Config 3,6							
	Config 1,4							
Dedicated CORESET Reference Channel	Config 2,5		-			-		-
	Config 3,6							
OCNG Patterns					0	P.1		
SS-RSSI-Measurement			Not Applicable					
SMTC configruation					SM	TC.1		
CCD configuration	Config 1,2,4,5				SSB	.1 FR1		
SSB configuration	Config 3,6		SSB.2 FR1					
PDSCH/PDCCH	Config 1,2,4,5		15					
subcarrier spacing Config 3,6 kH:		kHz			;	30		
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS		dB	0	0	0	0	0	n
EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS		- ub		U				0
EPRE ratio of PDSCH DMR	RS to SSS							
EPRE ratio of PDSCH to PDSCH					1			

FPRF ratio	of OCNG DMPS	S to SSS(Note 1)				
		NG DMRS (Note 1)				
		NR_FDD_FR1_A		1		TBD
		NR_TDD_FR1_A	[			
		NR_FDD_FR1_B	dBm/15k	-94.65		TBD
		NR_TDD_FR1_C				TBD
$N_{oc}^{\rm Note2}$	Config	NR_FDD_FR1_D			TBD	TBD
00	1,2,4,5	NR_TDD_FR1_D	Hz			
		NR_FDD_FR1_E NR_TDD_FR1_E				TBD
		NR_FDD_FR1_G	1			TBD
		NR_FDD_FR1_H	ĺ			TBD
	Config 1,2,4	5		-94.65	TBD	Same as Noc for
				0 1.00	155	15kHz
		NR_FDD_FR1_A NR_TDD_FR1_A				TBD
		NR_FDD_FR1_B	<u> </u> 			TBD
Note2		NR_TDD_FR1_C	dBm/SC			TBD
N Note2	Confin 2.0	NR_FDD_FR1_D	S	04.05	TDD	
	Config 3,6	NR_TDD_FR1_D	]	-91.65	TBD	TBD
		NR_FDD_FR1_E				TBD
		NR_TDD_FR1_E				
		NR_FDD_FR1_G NR_FDD_FR1_H	4			TBD TBD
$\hat{E}_s/I_{ot}$		1414_1   1515_1   1411_11	dB	10	TBD	TBD
$\hat{E}_s/N_{oc}$			dB	10	TBD	TBD
L <sub>s</sub> /1V <sub>oc</sub>		NR_FDD_FR1_A	ub	10	100	
		NR_TDD_FR1_A		-84.65		TBD
		NR_FDD_FR1_B				TBD
		NR_TDD_FR1_C				TBD
	Config	NR_FDD_FR1_D			TBD	TBD
	1,2,4,5	NR_TDD_FR1_D	_			
		NR_FDD_FR1_E NR_TDD_FR1_E				TBD
		NR_FDD_FR1_G				TBD
SS- RSRP <sup>Not</sup>		NR_FDD_FR1_H	dBm/SC			TBD
e3		NR_FDD_FR1_A	S			TBD
		NR_TDD_FR1_A				
		NR_FDD_FR1_B				TBD
		NR_TDD_FR1_C	}			TBD
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D		-81.65	TBD	TBD
		NR_FDD_FR1_E				TDD
		NR_TDD_FR1_E				TBD
		NR_FDD_FR1_G				TBD
		NR_FDD_FR1_H				TBD
		NR_FDD_FR1_A NR_TDD_FR1_A				TBD
		NR_FDD_FR1_B				TBD
		NR_TDD_FR1_C	ĺ			TBD
	Config	NR_FDD_FR1_D	dBm/	-56.28	TBD	
I Note?	1,2,4,5	NR_TDD_FR1_D	9.36MHz	-50.20	100	TBD
lo <sup>Note3</sup>		NR_FDD_FR1_E				TBD
		NR_TDD_FR1_E				TBD
		NR_FDD_FR1_G NR_FDD_FR1_H				TBD
		NR_FDD_FR1_A	dBm/			
	Config 3,6	NR_TDD_FR1_A	38.16MH	-50.19	TBD	TBD
		NR_FDD_FR1_B	Z			TBD

	NR_TDD_FR1_C			TBD
	NR_FDD_FR1_D			TBD
	NR_TDD_FR1_D			IDD
	NR_FDD_FR1_E			TBD
	NR_TDD_FR1_E			IDD
	NR_FDD_FR1_G			TBD
	NR_FDD_FR1_H			TBD
Propagation condition		-	AWGN	
Antenna configuration		-	1x2	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{cc}$  to be fulfilled.
- Note 3: SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.

#### A.8.5.2.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

#### A.8.5.2.1.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

#### A.8.5.2.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.1 in TS 36.133 [15] for inter-RAT FR2 SS-RSRP measurements.

## A.8.5.2.1.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.2.2-1. In this test case there are two cells on different carriers. Both absolute accuracy and relative accuracy requirements of SS-RSRP inter-RAT measurement are tested by using test setup in Table A.8.5.2.1.2.2-2 and Table A.8.5.2.1.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.8.5.2.1.2.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations

Configuration	Description					
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					

Table A.8.5.2.1.2.2-2: SS-RSRP Inter-RAT general test parameters

Donometer	l l i.t	Test 1	Test 2	Test 3	
Parameter	Unit	Cell 2	Cell 2	Cell 2	
SSB ARFCN		Freq1	freq1	freq1	
Duplex mode		TDD	TDD	TDD	
TDD configuration		TDDConf.3.1	TDDConf.3.1	TDDConf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>RB,c</sub> = 66	100: $N_{RB,c} = 66$	100: N <sub>RB,c</sub> = 66	
Downlink initial BWP configuration			DLBWP.0.1		
Downlink dedicated BWP configuration			DLBWP.1.1		
Uplink initial BWP configuration			ULBWP.0.1		
Uplink dedicated BWP configuration			ULBWP.1.1		
DRX cycle configuration	ms		Not applicable		
TRS configuration			TRS.2.1 TDD		
TCI state			TCI.State.0		
AoA setup		Se	etup 3 defined in A.3.	15	
PDSCH Reference measurement channel		-	•	-	
RMSI CORESET Reference Channel		-	•	-	
OCNG Patterns		OP.1	OP.1	OP.1	
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>					
$\hat{E}_s/N_{oc}$	dB	TBD	TBD	TBD	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.8.5.2.1.2.2-3: SS-RSRP Inter-RAT OTA related test parameters

D	Parameter		Test 1	Test 2	Test 3
Г			Cell 2	Cell 2	Cell 2
UE orientation around TBD axis and TBD axis		degrees	TBD	TBD	TBD
Relative difference cell 2 relative to cell 2	e in angle of arrival of ell 1	degrees	TBD	0	0
	NR_TDD_FR2_A				TBD
$N_{oc}^{ m Note1}$	NR_TDD_FR2_B	dBm/15kHz	TBD	TBD	TBD
oc .	NR_TDD_FR2_F				TBD
	NR_TDD_FR2_G		טפו	טפו	TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD
	NR_TDD_FR2_A	dPm/CCC			TBD
NR_TDD_FR2_B		dBm/SCS Note3	TBD	TBD	TBD
	NR_TDD_FR2_F				TBD

$N_{oc}^{ m Note1}$	NR_TDD_FR2_G				TBD
1 voc	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD
	NR_TDD_FR2_A				TBD
	NR_TDD_FR2_B	TBD			
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	TDD	TDD	TBD
	NR_TDD_FR2_G	NR_TDD_FR2_G Note4 TBD TBD	TBD		
	NR_TDD_FR2_T		TBD		
	NR_TDD_FR2_Y				TBD
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	TBD	TBD	TBD
	NR_TDD_FR2_A				TBD
	NR_TDD_FR2_B				TBD
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	TBD	TBD	TBD
	NR_TDD_FR2_G	MHz Note4	עמו	טפו	TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y	]			TBD

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not
- settable parameters themselves.

  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.

#### A.8.5.2.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

#### A.8.5.2.2 SS-RSRQ

## A.8.5.2.2.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.2 in TS 36.133 [15] for inter-RAT FR1 SS-RSRQ measurements.

## A.8.5.2.2.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.2.1.2-2.

Table A.8.5.2.2.1.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations

Config	Description					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note: The UE is only	Note: The UE is only required to be tested in one of the supported test configurations					

Table A.8.5.2.2.1.2-2: SS-RSRQ inter-RAT test parameters

Parameter		Unit	Tes Cel			st 2		st 3 ell 2
SSB ARFCN		fre			eq1		eq1	
	Config 1,4			1		DD		- 1
Duplex mode	Config 2,3,5,6				Т	DD		
	Config 1,4				Not Ap	plicable		
TDD configuration	Config 2,5				TDDC	Conf.1.1		
	Config 3,6				TDDC	Conf.2.1		
Downlink initial BWP cor	nfiguration				DLB\	WP.0.1		
Downlink dedicated BWI	configuration				DLB\	NP.1.1		
Uplink initial BWP config	uration				ULB\	NP.0.1		
Uplink dedicated BWP c	onfiguration				ULB\	NP.1.1		
DRX Cycle configuration		ms			Not Ap	plicable		
-	Config 1,4				TRS.	I.1 FDD		
TRS configuration	Config 2,5					I.1 TDD		
· 	Config 3,6				TRS.1	1.2 TDD		
	Config 1,4							
PDSCH Reference measurement channel	Config 2,5		-			-		-
	Config 3,6							
	Config 1,4							
RMSI CORESET Reference Channel	Config 2,5		-			-		-
	Config 3,6							
	Config 1,4							
Dedicated CORESET Reference Channel	Config 2,5		-			-		-
	Config 3,6							
OCNG Patterns					0	P.1		
SS-RSSI-Measurement					Not Ap	plicable		<u> </u>
SMTC configruation					SM	TC.1		
SSB configuration	Config 1,2,4,5				SSB	.1 FR1		
SSB Comiguration	Config 3,6				SSB	.2 FR1		
PDSCH/PDCCH	Config 1,2,4,5					15		
subcarrier spacing	JOH							
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS		4						
EPRE ratio of PDCCH DMF EPRE ratio of PDCCH to PI		dB	0	0	0	0	0	0
EPRE ratio of PDSCH DMF		$\dashv$						
EPRE ratio of PDSCH to PI		7						
EPRE ratio of OCNG DMRS								

EPRE ratio	of OCNG to OC	NG DMRS (Note 1)				_
		NR_FDD_FR1_A				TBD
		NR_TDD_FR1_A				
		NR_FDD_FR1_B NR_TDD_FR1_C				TBD TBD
$N_{oc}^{ m Note2}$	Config	NR_FDD_FR1_D	dBm/15k	00.40	TDD	
IV oc	1,2,4,5	NR_TDD_FR1_D	Hz	-80.18	TBD	TBD
		NR_FDD_FR1_E NR_TDD_FR1_E				TBD
		NR_FDD_FR1_G				TBD
		NR_FDD_FR1_H				TBD
	Config 1,2,4	,5		-80.18	TBD	Same as Noc for 15kHz
		NR_FDD_FR1_A				
		NR_TDD_FR1_A				TBD
		NR_FDD_FR1_B				TBD
N oc Note2		NR_TDD_FR1_C NR_FDD_FR1_D	dBm/SC			TBD
	Config 3,6	NR_TDD_FR1_D	S	-83.27	TBD	TBD
		NR_FDD_FR1_E				TBD
		NR_TDD_FR1_E NR_FDD_FR1_G				TBD
		NR_FDD_FR1_H	1			TBD
$\hat{E}_s/I_{ot}$		<del>. – – –</del>	dB	-1.75	TBD	TBD
$\hat{E}_s/N_{oc}$			dB	-1.75	TBD	TBD
	Config 1,2,4,5	NR_FDD_FR1_A			TBD	TBD
		NR_TDD_FR1_A NR_FDD_FR1_B				TBD
		NR_TDD_FR1_C				TBD
		NR_FDD_FR1_D		-81.93		TBD
		NR_TDD_FR1_D NR_FDD_FR1_E				
		NR_TDD_FR1_E				TBD
SS-		NR_FDD_FR1_G				TBD
RSRPNot		NR_FDD_FR1_H NR_FDD_FR1_A	dBm/SC S			TBD
e3		NR_TDD_FR1_A	3			TBD
		NR_FDD_FR1_B				TBD
		NR_TDD_FR1_C				TBD
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D		-85.02	TBD	TBD
		NR_FDD_FR1_E				TBD
		NR_TDD_FR1_E				
		NR_FDD_FR1_G NR_FDD_FR1_H				TBD TBD
	<u> </u>	NR_FDD_FR1_A				100
		NR_TDD_FR1_A				
		NR_FDD_FR1_B				
00 505 5	Note2	NR_TDD_FR1_C NR_FDD_FR1_D			<b></b> -	
SS-RSRQ	NOTES	NR_TDD_FR1_D	dB	-14.77	TBD	TBD
		NR_FDD_FR1_E				
		NR_TDD_FR1_E NR_FDD_FR1_G				
		NR_FDD_FR1_H				
		NR_FDD_FR1_A				TBD
Io <sup>Note3</sup>	Config	NR_TDD_FR1_A	dBm/	-50	TBD	
	1,2,4,5	NR_FDD_FR1_B NR_TDD_FR1_C	9.36MHz	-		TBD TBD
L		T '41/_100_11/1_0				טטו

		NR_FDD_FR1_D NR_TDD_FR1_D				TBD
		NR_FDD_FR1_E NR_TDD_FR1_E				TBD
		NR_FDD_FR1_G				TBD
		NR_FDD_FR1_H				TBD
		NR_FDD_FR1_A NR_TDD_FR1_A				TBD
		NR_FDD_FR1_B	dBm/ 38.16MH			TBD
		NR_TDD_FR1_C				TBD
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D		-50	TBD	TBD
		NR_FDD_FR1_E NR_TDD_FR1_E	Z			TBD
		NR_FDD_FR1_G	]			TBD
		NR_FDD_FR1_H				TBD
Propagatio	Propagation condition		-	AWGN		
Antenna configuration		-	1x2			

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{\infty}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.

#### A.8.5.2.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

# A.8.5.2.2.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

#### A.8.5.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.2 in TS 36.133 [15] for inter-RAT FR2 SS-RSRQ measurements.

#### A.8.5.2.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.2.2-1. In this test case there are two cells on different carriers. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-RAT measurement are tested by using test setup in Table A.8.5.2.2.2.2-2 and Table A.8.5.2.2.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.8.5.2.2.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations

	Configuration	Description					
ĺ	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					

Table A.8.5.2.2.2.2: SS-RSRQ Inter-RAT general test parameters

Parameter	Unit	Test 1	Test 2	Test 3		
Parameter	Unit	Cell 2	Cell 2	Cell 2		
SSB ARFCN		Freq1	freq1	freq1		
Duplex mode		TDD	TDD	TDD		
TDD configuration		TDDConf.3.1	TDDConf.3.1	TDDConf.3.1		
BW <sub>channel</sub>	MHz	100: $N_{RB,c} = 66$	100: $N_{RB,c} = 66$	100: $N_{RB,c} = 66$		
Downlink initial BWP configuration			DLBWP.0.1			
Downlink dedicated BWP configuration			DLBWP.1.1			
Uplink initial BWP configuration			ULBWP.0.1			
Uplink dedicated BWP configuration			ULBWP.1.1			
DRX cycle configuration	ms		Not applicable			
TRS configuration			TRS.2.1 TDD			
TCI state		TCI.State.0				
AoA setup		Setup 3 defined in A.3.15				
PDSCH Reference measurement channel		-	-	-		
RMSI CORESET Reference Channel		-	-	-		
OCNG Patterns		OP.1	OP.1	OP.1		
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2		
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120		
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0		
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>						
$\hat{E}_s/N_{oc}$	dB	TBD	TBD	TBD		

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-SINR, SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.8.5.2.2.2-3: SS-RSRQ Inter-RAT OTA related test parameters

D		1124	Test 1	Test 2	Test 3
Parameter		Unit	Cell 2	Cell 2	Cell 2
UE orientation around TBD axis and TBD axis		degrees	TBD	TBD	TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD	0	0
$N_{oc}^{}$ Note1	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F	dBm/15kHz <sup>N</sup>			TBD TBD TBD
TV <sub>oc</sub>	NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	ote4	TBD	TBD	TBD TBD TBD
$N_{oc}^{ m Note1}$	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dBm/SCS <sup>Note</sup>	TBD	TBD	TBD TBD TBD TBD TBD TBD TBD
SS-RSRPNote2	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dBm/SCS Note4	TBD	TBD	TBD TBD TBD TBD TBD TBD TBD TBD
SS-RSRQ <sup>Note2</sup>	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dB	TBD	TBD	TBD TBD TBD TBD TBD TBD TBD
$\hat{E}_{s}/I_{ot}$		dB	TBD	TBD	TBD
IoNote2	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T	dBm/95.04 MHz <sup>Note4</sup>	TBD	TBD	TBD TBD TBD TBD TBD
Nata 4 Lataufana	NR_TDD_FR2_Y		- (		TBD

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 6: NR operating band groups are as defined in clause 3.5.2.

#### A.8.5.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

In this test case there are two cells on different carriers and measurement gaps are provided

#### A.8.5.2.3 SS-SINR

## A.8.5.2.3.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS- SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.3 in TS 36.133 [15] for inter-RAT FR1 SS-SINR measurements.

#### A.8.5.2.3.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.3.1.2-2.

Table A.8.5.2.3.1.2-1: SS- SINR Inter-RAT SS- SINR supported test configurations

Config	Description					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note: The UE is only	Note: The UE is only required to be tested in one of the supported test configurations					

Table A.8.5.2.3.1.2-2: SS-SINR inter-RAT test parameters

Parameter		Unit	Test 1	Test 2	Test 3		
Faraille			Cell 2	Cell 2	Cell 2		
SSB ARFCN			freq1	freq1			
Duplex mode	Config 1,4						
Dapiex mode	Config 2,3,5,6	2,3,5,6 TDD					
	Config 1,4	_		Not Applicable			
TDD configuration	Config 2,5	_		TDDConf.1.1			
	Config 3,6			TDDConf.2.1			
Downlink initial BWP cor	nfiguration			DLBWP.0.1			
Downlink dedicated BWI	P configuration			DLBWP.1.1			
Uplink initial BWP config	uration			ULBWP.0.1			
Uplink dedicated BWP c	Uplink dedicated BWP configuration		ULBWP.1.1				
DRX Cycle configuration	1	ms	Not Applicable				
	Config 1,4		TRS.1.1 FDD				
TRS configuration	Config 2,5		TRS.1.1 TDD				
	Config 3,6			TRS.1.2 TDD			
	Config 1,4						
PDSCH Reference measurement channel	Config 2,5		-	-	-		
	Config 3,6						
RMSI CORESET Reference Channel	Config 1,4		-	-	-		

			<u> </u>			1			
		Config 2,5							
		Config 3,6							
		Config 1,4							
Dedicated Reference	CORESET Channel	Config 2,5			-				-
		Config 3,6							
OCNG Pat	terns					0	P.1		
SS-RSSI-N	/leasurement					Not Ap	plicable		
SMTC con	figruation						TC.1		
		Config 1,2,4,5				SSB.	1 FR1		
SSB config	guration	Config 3,6				SSB.	2 FR1		
PDSCH/PI	CCH	Config 1,2,4,5					15		
subcarrier		Config 3,6	kHz				30		
	of PSS to SS	<u> </u>				<u> </u>			
EPRE ratio	of PBCH DM	IRS to SSS							
	of PBCH to F					0 0			
	of PDCCH to		٩D	0	0		0	0	0
	of PDSCH D	PDCCH DMRS MRS to SSS	dB	0	U				
	of PDSCH to								
EPRE ratio	of OCNG DN	/IRS to SSS <sup>(Note 1)</sup>							
EPRE ratio	of OCNG to	OCNG DMRS (Note 1)							
		NR_FDD_FR1_A		[-80]		[-108.5]		[-119.5]	
		NR_TDD_FR1_A NR_FDD_FR1_B							19]
		NR_TDD_FR1_C							18.5]
N oc Note2	Config	NR_FDD_FR1_D	dBm/15k					_	18]
1 voc	1,2,4,5	NR_TDD_FR1_D	Hz					[- '	10]
		NR_FDD_FR1_E						[-1	17.5]
		NR_TDD_FR1_E NR_FDD_FR1_G						[-116.5]	
		NR_FDD_FR1_H							16]
	Config 1,2,4			Γ_ Ω	30]	[-10	8 51		s Noc for
	Joining 1,2,4			[-0	,~ <u>1</u>	[-10	J.J	15	kHz
		NR_FDD_FR1_A NR_TDD_FR1_A						[-1	16.5]
		NR_FDD_FR1_B						[-1	16]
Note2		NR_TDD_FR1_C	dBm/SC						15.5]
$N_{oc}^{\text{Note2}}$	Config 3,6	NR_FDD_FR1_D	S	[-7	77]	[-10	5.51	_	15]
	25.mg 0,0	NR_TDD_FR1_D		'	- 1	'."	1		. • ,
		NR_FDD_FR1_E NR_TDD_FR1_E						[-1]	14.5]
		NR_FDD_FR1_G						[-1	14.5]
		NR_FDD_FR1_H							13]
$\hat{E}_{s}/I_{ot}$		dB	[-1.	.75]	[2	0]	[-4	4.0]	
$\hat{E}_{s}/N_{oc}$			dB	[-1.	.75]	[2	0]	[-4	4.0]
SS- RSRP <sup>Not</sup>	Config	NR_FDD_FR1_A NR_TDD_FR1_A	dBm/SC	F 0.4	751	1.00	D 51	[-12	23.5]
e3	1,2,4,5	NR_FDD_FR1_B NR_TDD_FR1_C	S	[-81 	.75]	[-88			[23] [22.5]
			<u> </u>	l		1		L 14	~]

Propagation	n nondition				AWGN	
		NR_FDD_FR1_H				[-80.5]
		NR_FDD_FR1_G				[-81]
		NR_TDD_FR1_E				
		NR_FDD_FR1_E				[-82]
	Config 3,6	NR_TDD_FR1_D	38.16MH z	[-43.73]	[-54.41]	[-82.5]
	0	NR FDD FR1 D	dBm/	1 40 701	[ [ ] ]	
		NR_TDD_FR1_C				[-83]
		NR_TDD_FR1_A NR_FDD_FR1_B				[-83.5]
		NR_FDD_FR1_A				[-84]
Io <sup>Note3</sup>		NR_FDD_FR1_H				[-86.59]
		NR_FDD_FR1_G				[-87.09]
		NR_TDD_FR1_E				[-88.09]
		NR_FDD_FR1_E				[00.00.1
	1,2,4,5	NR_TDD_FR1_D	9.36MHz	[-49.83]	[-60.5]	[-88.59]
	Config	NR_FDD_FR1_D	dBm/			-
		NR_TDD_FR1_C				[-89.09]
		NR FDD FR1 B				[-89.59]
		NR_FDD_FR1_A NR_TDD_FR1_A				[-90.09]
Т		NR_FDD_FR1_H				
		NR_FDD_FR1_G				
	NR_TDD_FR1_E					
	NR_FDD_FR1_E					
SS-SINR No	ne3	NR_TDD_FR1_D	dB	[-1.75]	[20]	[-4.0]
CC CINID N	nte3	NR_FDD_FR1_D		[475]	[00]	[ 4 0]
	NR TDD FR1 C					
		NR_FDD_FR1_B	1			
		NR_FDD_FR1_A NR_TDD_FR1_A				
		NR_FDD_FR1_H				[-117]
		NR_FDD_FR1_G				[-117.5]
		NR_TDD_FR1_E				
		NR_FDD_FR1_E	]			[-118.5]
	Config 3,6	NR_TDD_FR1_D		[-78.75]	[-85.5]	[-119]
		NR FDD FR1 D				
		NR_FDD_FR1_B NR_TDD_FR1_C				[-120] [-119.5]
		NR_TDD_FR1_A	}			
		NR_FDD_FR1_A				[-120.5]
		NR_FDD_FR1_H				[-120]
		NR_FDD_FR1_G				[-120.5]
		NR_TDD_FR1_E	]			[-121.5]
		NR_FDD_FR1_E				[ 404 5]
		NR_FDD_FR1_D NR_TDD_FR1_D				[-122]

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3.5.2.

#### A.8.5.2.3.1.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

#### A.8.5.2.3.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

#### A.8.5.2.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS- SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.3 in TS 36.133 [15] for inter-RAT FR2 SS-SINR measurements.

#### A.8.5.2.3.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.2.2-1. In this test case there are two cells on different carriers. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-RAT measurement are tested by using test setup in Table A.8.5.2.3.2.2-2 and A.8.5.2.3.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table [TBD] and TRS configuration for Cell 1 is defined in Table [TBD].

Table A.8.5.2.3.2.2-1: SS-SINR Inter-RAT SS-SINR supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.8.5.2.3.2.2-2: SS-SINR Inter-RAT general test parameters

Dovementor	l lmit	Test 1	Test 2	Test 3	
Parameter	Unit	Cell 2	Cell 2	Cell 2	
SSB ARFCN		Freq1	freq1	freq1	
Duplex mode		TDD	TDD	TDD	
TDD configuration		TDDConf.3.1	TDDConf.3.1	TDDConf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>RB,c</sub> = 66	100: $N_{RB,c} = 66$	100: N <sub>RB,c</sub> = 66	
Downlink initial BWP configuration			DLBWP.0.1		
Downlink dedicated BWP configuration			DLBWP.1.1		
Uplink initial BWP configuration			ULBWP.0.1		
Uplink dedicated BWP configuration			ULBWP.1.1		
DRX cycle configuration	ms		Not applicable		
TRS configuration			TRS.2.1 TDD		
TCI state			TCI.State.0		
AoA setup		Se	etup 3 defined in A.3.	15	
PDSCH Reference measurement channel		-	-	-	
RMSI CORESET Reference Channel		-	-	-	
OCNG Patterns		OP.1	OP.1	OP.1	
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>					
$\hat{E}_s/N_{oc}$	dB	TBD	TBD	TBD	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-SINR, SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.8.5.2.3.2.2-3: SS-SINR Inter-RAT OTA related test parameters

Parameter		Unit	Test 1	Test 2	Test 3
		Unit	Cell 2	Cell 2	Cell 2
UE orientation aroun	d TBD axis and TBD	degrees	TBD	TBD	TBD
Relative difference in angle of arrival of			<b>TDD</b>		
cell 2 relative to cell		degrees	TBD	0	0
	NR_TDD_FR2_A				TBD
	NR_TDD_FR2_B				TBD
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/15kHz	TBD	TBD	TBD
	NR_TDD_FR2_G	Note4	טפו	100	TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD
	NR_TDD_FR2_A				TBD
	NR_TDD_FR2_B				TBD
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS	TBD	TBD	TBD
	NR_TDD_FR2_G	Note3			TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD
	NR_TDD_FR2_A	dBm/SCS Note4			TBD
	NR_TDD_FR2_B				TBD
SS-RSRPNote2	NR_TDD_FR2_F		TBD	TBD	TBD
OO IXOIXI	NR_TDD_FR2_G				TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD
	NR_TDD_FR2_A				TBD
	NR_TDD_FR2_B				TBD
SS-SINR <sup>Note2</sup>	NR_TDD_FR2_F	dB	TBD	TBD	TBD
OO OIIVIN	NR_TDD_FR2_G	u u u	100	100	TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	TBD	TBD	TBD
	NR_TDD_FR2_A				TBD
	NR_TDD_FR2_B				TBD
lo <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	TBD	TBD	TBD
10 "	NR_TDD_FR2_G	MHz Note4	טטו	100	TBD
	NR_TDD_FR2_T				TBD
	NR_TDD_FR2_Y				TBD

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 2: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 6: NR operating band groups are as defined in clause 3.5.2.

#### A.8.5.2.3.2.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

# Annex B (normative):

# Conditions for RRM requirements applicability for operating bands

# B.1 Conditions for NR RRC\_IDLE state mobility

# B.1.1 Introduction

In Annex B.1, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurements procedures and requirements in clause 4,
- UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in clause 4.

# B.1.2 Conditions for measurements on NR intra-frequency cells for cell re-selection

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB  $\hat{E}s/Iot$ , applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

The conditions are defined in Table B.1.2-2 for FR2 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

		Minimum	SSB Ês/lot	
Parameter	NR operating band groups Note1	dBm /	SCS <sub>SSB</sub>	
Parameter	NK operating band groups	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB
	NR_FDD_FR1_A, NR_TDD_FR1_A	-124	-121	
	NR_FDD_FR1_B	-123.5	-120.5	
	NR_TDD_FR1_C	-123	-120	
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	≥ -4
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
_	NR_FDD_FR1_G	-121	-118	
	NR FDD FR1 H	-120.5	-117.5	

Table B.1.2-2: Conditions for intra-frequency cell re-selection in FR2

				SSB Ês/lot					
		ND			dBm / SC	S <sub>SSB</sub>			
Parameter	Angle of arrival	NR operating		SCS <sub>SSB</sub> =	: 120 kHz		SCS <sub>SSB</sub> = 240 kHz	40	
		bands		UE Pow	er class		UE Power class	dB	
			1	2	3	4	1, 2, 3, 4		
		n257	- 125.3+Y <sub>1</sub>	- 122.3+Y <sub>2</sub>	-109.1	- 124.8+Y <sub>4</sub>	(Value for		
	Rx Beam Peak	n258	- 125.3+Y <sub>1</sub>	- 122.3+Y <sub>2</sub>	-109.1	- 124.8+Y <sub>4</sub>			
		Peak	n260	- 122.3+Y <sub>1</sub>		-106.5	- 122.8+Y <sub>4</sub>	$SCS_{SSB} = 120$ kHz) +3dB	≥-4
Conditions		n261	- 125.3+Y <sub>1</sub>	- 122.3+Y <sub>2</sub>	-109.1	- 124.8+Y <sub>4</sub>	_		
Conditions		n257	- 117.3+Z₁	- 111.3+Z <sub>2</sub>	- 105.2+Z <sub>3</sub>	- 115.8+Z <sub>4</sub>			
	Spherical	n258	- 117.3+Z₁	- 111.3+Z <sub>2</sub>	- 105.2+Z <sub>3</sub>	- 115.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-4	
	coverage Note 1	n260	- 114.3+Z₁		- 100.9+Z <sub>3</sub>	- 110.8+Z <sub>4</sub>	kHz) +3dB	<b>&lt;-4</b>	
		n261	- 117.3+Z₁	- 111.3+Z <sub>2</sub>	- 105.2+Z <sub>3</sub>	- 115.8+Z <sub>4</sub>			

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB Es/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.1.2-2:

# B.1.3 Conditions for measurements on NR inter-frequency cells for cell re-selection

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB Es/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

The conditions defined in Table B.1.2-2 for FR2 NR intra-frequency cell re-selection shall also apply for FR2 NR inter-frequency cells in this clause.

<sup>-</sup> The value of Y for Power classes 1, 2 and 4 is FFS, where Y<sub>1</sub>, Y<sub>2</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1, 2 and 4 respectively

<sup>-</sup> The value of Z for Power classes 1, 2, 3 and 4 is FFS, where Z<sub>1</sub>, Z<sub>2</sub>, Z<sub>3</sub>, and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1, 2, 3 and 4 respectively

# B.2 Conditions for UE measurements procedures and performance requirements in RRC\_CONNECTED state

# B.2.1 Introduction

# B.2.1.1 General

In Annex B.2, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurements procedures and requirements in clause 9, UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in clause 9,
- UE conditions which shall apply for UE intra-frequency measurements performance requirements in clause 10,
- UE conditions which shall apply for UE inter-frequency measurements performance requirements in clause 10.
- UE conditions which shall apply for UE inter-frequency measurements performance requirements in clause 10,
- The conditions for RRC connection release with redirection to NR requirements in clause 6.2.3.2.1,
- The conditions for UE transmit timing adjustment in clause 7.1.

# B.2.1.2 Derivation of Minimum SSB RP values for FR1

[FFS]

# B.2.1.3 Derivation of Minimum SSB RP values for FR2

## B.2.1.3.1 Minimum SSB\_RP values for Rx Beam Peak angle of arrival

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on Reference sensitivity for the Operating band and for the UE Power class, and taking a baseline of UE Power class 3 in Band n260 with 50 MHz channel bandwidth.

 $\label{eq:minimum_SSB_RP} \begin{aligned} &\text{Minimum SSB\_RP} = \text{Reference sensitivity}_{PC3, \text{ n}260, \text{ 50MHz}} + Y \text{ -10Log}_{10}(PRB_{Refsens} \text{ x } 12) - SNR_{Refsens} + SSB \text{ } \hat{E}s/Iot + \Sigma MB_{PSM} + SSB \text{ } \hat{E}s/Iot$ 

EIS Reference sensitivity  $_{PC3, n260, 50MHz}$  is the Reference sensitivity value in dBm specified for Power Class 3 in Band n260 for 50MHz Channel bandwidth in Table 7.3.2.3-1 of TS 38.101-2 [19].

Y is the gain difference between fine and rough beams, and is 7dB for a Power Class 3 UE. The value for other Power Classes is defined in Table B.2.1.3.1-1.

Table B.2.1.3.1-1: Gain difference Y between fine and rough beams, Rx beam peak direction

Value "Y" in dB, for each UE Power class						
1 2 3 4						
FFS	[9.0]	7.0	FFS			

 $PRB_{Refsens}$  is  $N_{RB}$  associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32.

12 is the number of subcarriers in a PRB.

SNR<sub>Refsens</sub> is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1dB.

SSB Ês/Iot is the minimum value required by the UE to perform measurements, and is -6dB for intra-frequency measurements and -4dB for inter-frequency measurements. The only contribution to Iot is the UE internal noise.

ΣMB<sub>P</sub> is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE Power class 3 in Band n260 is  $(-109.5 + \Sigma MB_P)$  dBm/120kHz for intra-frequency measurements and  $(-107.5 + \Sigma MB_P)$  dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band\_Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -109.5 dBm/120kHz + Refsens  $_{PC_X, Band_Y, 50MHz}$  - Refsens  $_{PC_X, Band_Y, 50MHz}$  - Refsens  $_{PC_X, Band_Y, 50MHz}$  +  $Y_{PC_X}$  -  $Y_{PC_X}$  +  $Y_{PC_X$ 

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -107.5 dBm/120kHz + Refsens  $_{PC_X, Band_Y, 50MHz}$  - Refsens  $_{PC_3, n260, 50MHz}$  +  $Y_{PC_3}$  -  $Y_{PC_3}$  +  $Y_{PC_3}$  -  $Y_{PC_3}$ 

Editor's notes:

- May need to change Power Class and Band terminology (to A, B?) to avoid confusion with Y, Z dB values
- If changed, would also need to align TS 38.101-4 clause 4.5.3.3, and also TR 38.810

### B.2.1.3.2 Minimum SSB\_RP values for angle of arrival within Spherical coverage

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on EIS Spherical coverage for the Operating band and for the UE Power class, and taking a baseline of UE Power class 3 in Band n260 with 50 MHz channel bandwidth.

 $\label{eq:minimum_SSB_RP} \begin{aligned} &\text{Minimum SSB\_RP} = EIS \text{ spherical coverage }_{PC3, \text{ } n260, \text{ } 50\text{MHz}} + Z \text{ } -10Log_{10}(PRB_{Refsens} \text{ } x \text{ } 12) - SNR_{Refsens} + SSB \text{ } \hat{E}s/Iot + \Sigma MB_S \end{aligned}$ 

where:

EIS spherical coverage  $_{PC3, n260, 50MHz}$  is the EIS spherical coverage value in dBm specified for Power Class 3 in Band n260 for 50MHz Channel bandwidth in TS 38.101-2 [19] Table 7.3.4.3-1.

Z is the gain difference between fine and rough beams, and is [FFS]dB for a Power Class 3 UE. The value for other Power Classes is defined in Table B.2.1.3.2-1.

Table B.2.1.3.2-1: Gain difference Z between fine and rough beams, Spherical coverage directions

Value "Z" in dB, for each UE Power class							
1 2 3 4							
FFS	[9.0]	FFS	FFS				

 $PRB_{Refsens}$  is  $N_{RB}$  associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32.

12 is the number of subcarriers in a PRB.

SNR<sub>Refsens</sub> is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1dB.

SSB Ês/Iot is the minimum value required by the UE to perform measurements, and is -6dB for intra-frequency measurements and -4dB for inter-frequency measurements. The only contribution to Iot is the UE internal noise.

ΣMB<sub>s</sub> is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE Power class 3 in Band n260 is (-103.9+ $\Sigma$ MB<sub>S</sub> +Z) dBm/120kHz for intra-frequency measurements and is (-101.9+ $\Sigma$ MB<sub>S</sub> +Z) dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band Y) is used:

 $For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = (-103.9 + \Sigma MB_S + Z) \ dBm/120kHz + Refsens \ _{PC\_X, Band\_Y, 50MHz} - Refsens \ _{PC3, n260, 50MHz} + Z \ _{PC\_X} - Z \ _{PC3} + \Sigma MB_S$ 

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = (-101.9+ $\Sigma$ MB<sub>S</sub> +Z) dBm/120kHz + Refsens <sub>PC\_X</sub>, <sub>Band\_Y</sub>, <sub>50MHz</sub> - Refsens <sub>PC3</sub>, <sub>n260</sub>, <sub>50MHz</sub> + Z <sub>PC\_X</sub> - Z <sub>PC3</sub> + $\Sigma$ MB<sub>S</sub>

Editor's notes:

- May need to change Power Class and Band terminology (to A, B?) to avoid confusion with Y, Z dB values
- If changed, would also need to align TS 38.101-4 clause 4.5.3.3, and also TR 38.810

# B.2.2 Conditions for NR intra-frequency measurements

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

		Minimum	SSB Ês/lot						
Parameter	NR operating band groups Note1	dBm / 🤄	SCS <sub>SSB</sub>						
rarameter	Mix operating band groups	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB					
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-127	-124						
	NR_FDD_FR1_B	-126.5	-123.5						
Conditions	NR_TDD_FR1_C	-126	-123	> 0					
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-125.5	-122.5	≥ -6					
	NR_FDD_FR1_E, NR_TDD_FR1_E	-125	-122						
	NR_FDD_FR1_G	-124	-121						
	NR_FDD_FR1_H	-123.5	-120.5						
NOTE 1:NR	NOTE 1:NR operating band groups are defined in clause 3.5.2.								

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

				Minin		SSB Ês/lot				
		NR			dBm / SC	Sssb				
Parameter	Angle of arrival	operating bands		SCS <sub>SSB</sub> =	120 kHz		SCS <sub>SSB</sub> = 240 kHz	dB		
		Danus		UE Power class				ав		
			1	2	3	4	1, 2, 3, 4			
	Rx Beam Peak	n257	- 128.3+Y <sub>1</sub>	[-113.8]	-112.1	- 127.8+Y <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120 kHz) +3dB			
		n258	- 128.3+Y <sub>1</sub>	[-113.8]	-112.1	- 127.8+Y <sub>4</sub>		≥-6		
		n260	- 125.3+Y <sub>1</sub>		-109.5	- 125.8+Y <sub>4</sub>				
Conditions		n261	- 128.3+Y <sub>1</sub>	[-113.8]	-112.1	- 127.8+Y <sub>4</sub>				
Conditions		n257	- 120.3+Z <sub>1</sub>	[-102.8]	- 108.2+Z <sub>3</sub>	- 118.8+Z₄				
	Spherical	•	- 120.3+Z <sub>1</sub>	[-102.8]	- 108.2+Z <sub>3</sub>	- 118.8+Z <sub>4</sub>	(Value for SCSssb = 120 kHz) +3dB	≥-6		
	coverage Note 1	n260	- 117.3+Z <sub>1</sub>		- 103.9+Z <sub>3</sub>	- 113.8+Z₄		=-0		
		_		n261	- 120.3+Z <sub>1</sub>	[-102.8]	- 108.2+Z <sub>3</sub>	- 118.8+Z <sub>4</sub>		

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB £s/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

- The value of Y for Power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1, 3 and 4 is FFS, where  $Z_1$ ,  $Z_3$ , and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for Power classes 1, 3 and 4 respectively

# B.2.3 Conditions for NR inter-frequency measurements

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

		Minimum	SSB Ês/lot	
Parameter	NR operating band groups Note1	dBm /	SCS <sub>SSB</sub>	
	NK operating band groups	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-125	-122	
	NR_FDD_FR1_B	-124.5	-121.5	
Conditions	NR_TDD_FR1_C	-124	-121	> 1
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	≥ -4
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120	
	NR_FDD_FR1_G	-122	-119	
	NR_FDD_FR1_H	-121.5	-118.5	
NOTE 1:NR	operating band groups are defined in clause	3.5.2.		

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

				SSB Ês/lot					
Parameter	Angle of arrival	NR operating		SCS <sub>SSB</sub> =	dBm / SC = 120 kHz	<b>S</b> SSB	SCS <sub>SSB</sub> = 240 kHz	_	
		bands		UE Pow	er class		UE Power class	dB	
			1	2	3	4	1, 2, 3, 4		
		n257	- 126.3+Y <sub>1</sub>	[-111.8]	-110.1	- 125.8+Y <sub>4</sub>			
	Rx Beam Peak	Rx Beam	n258	- 126.3+Y <sub>1</sub>	[-111.8]	-110.1	- 125.8+Y <sub>4</sub>	(Value for	
		n260	- 123.3+Y <sub>1</sub>		-107.5	- 123.8+Y <sub>4</sub>	SCS <sub>SSB</sub> = 120 kHz) +3dB	≥-4	
O a malifica ma		n261	- 126.3+Y <sub>1</sub>	[-111.8]	-110.1	- 125.8+Y <sub>4</sub>			
Conditions		n257	- 118.3+Z₁	[-100.8]	- 106.2+Z <sub>3</sub>	- 116.8+Z <sub>4</sub>			
	Spherical	1 '	n258	- 118.3+Z <sub>1</sub>	[-100.8]	- 106.2+Z <sub>3</sub>	- 116.8+Z <sub>4</sub>	(Value for	S 4
	coverage Note 1	n260	- 115.3+Z <sub>1</sub>		- 101.9+Z <sub>3</sub>	- 111.8+Z <sub>4</sub>	SCS <sub>SSB</sub> = 120 kHz) +3dB	≥-4	
		n261	- 118.3+Z₁	[-100.8]	- 106.2+Z <sub>3</sub>	- 116.8+Z <sub>4</sub>			

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB £s/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

- The value of Y for Power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1, 3 and 4 is FFS, where Z<sub>1</sub>, Z<sub>3</sub>, and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1, 3 and 4 respectively

# B.2.4 Conditions for NR L1-RSRP reporting

# B.2.4.1 Conditions for SSB based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs: SSB\_RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.1-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.1-2 for FR2 NR cells.

Table B.2.4.1-1: Conditions for SSB based L1-RSRP measurements in FR1

		Minimum	SSB Ês/lot	
Parameter	NR operating band groups Note1	dBm /	SCS <sub>SSB</sub>	
	ian operating band groups	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB
NR_FDD_FR1_A, NR_TDD_F NR_SDL_FR1_A	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	
	NR_FDD_FR1_B	-123.5	-120.5	
Conditions	NR_TDD_FR1_C	-123	-120	<b>\</b> 0
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	≥ -3
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1:NR	operating band groups are defined in clause	e 3.5.2.		

Table B.2.4.1-2: Conditions for SSB based L1-RSRP measurements in FR2

				Minir	num SSB_	RP Note 2, Note	3	SSB Ês/lot
		NR operating						
Parameter	Angle of arrival			SCS <sub>SSB</sub> =	= 120 kHz		SCS <sub>SSB</sub> = 240 kHz	40
		bands		UE Pow	er class		UE Power class	dB
			1	2	3	4	1, 2, 3, 4	
Rx E		n257	- 125.3+Y <sub>1</sub>	-113.3	-109.1	- 124.8+Y <sub>4</sub>		≥-3
	Rx Beam	n258	- 125.3+Y <sub>1</sub>	-113.3	-109.1	- 124.8+Y <sub>4</sub>	(Value for	
	Peak	n260	- 122.3+Y <sub>1</sub>		-106.5	- 122.8+Y <sub>4</sub>	$SCS_{SSB} = 120$ kHz) +3dB	
Conditions		n261	- 125.3+Y <sub>1</sub>	-113.3	-109.1	- 124.8+Y <sub>4</sub>		
Conditions		n257	- 117.3+Z <sub>1</sub>	-102.3	-98.2	- 115.8+Z <sub>4</sub>		
	Spherical coverage Note 1	n258	- 117.3+Z <sub>1</sub>	-102.3	-98.2	- 115.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-3
		n260	- 114.3+Z <sub>1</sub>	Z <sub>1</sub> -93.9 - 110.8+Z <sub>4</sub>		kHz) +3dB	<u>-</u> -3	
		n261	- 117.3+Z <sub>1</sub>	-102.3	-98.2	- 115.8+Z <sub>4</sub>		

- Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
- Note 2: Values specified at the Reference point to give minimum SSB Ês/lot, with no applied noise.
- Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.4.1-2:

- The value of Y for Power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

# B.2.4.2 Conditions for CSI-RS based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on CSI-RS: CSI-RS\_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.2-2 for FR2 NR cells.

Table B.2.4.2-1: Conditions for CSI-RS based L1-RSRP measurements in FR1

	NR operating		Minimum CSI-RS_RP		CSI-RS Ês/lot	
Parameter	band groups Note1		dBm / SCS <sub>CSI-RS</sub>		dB	
	bana groups	SCS <sub>CSI-RS</sub> = 15 kHz	SCS <sub>CSI-RS</sub> = 30 kHz	SCS <sub>CSI-RS</sub> = 60 kHz	ub	
	NR_FDD_FR1_A,					
	NR_TDD_FR1_A,	-124	-121	-118		
	NR_SDL_FR1_A					
	NR_FDD_FR1_B	-123.5	-120.5	-117.5		
	NR_TDD_FR1_C	-123	-120	-117		
Conditions	NR_FDD_FR1_D,	-122.5	-119.5	-116.5	≥ -3	
	NR_TDD_FR1_D	-122.5	-119.5	-110.9		
	NR_FDD_FR1_E,	-122	-119	-116		
	NR_TDD_FR1_E	-122	-119	-110		
	NR_FDD_FR1_G	-121	-118	-115		
	NR_FDD_FR1_H	-120.5	-117.5	-114.5		
NOTE 1: NF	operating band group	s are defined in clause	3.5.2.			

Table B.2.4.2-2: Conditions for CSI-RS based L1-RSRP measurements in FR2

				Minimum CSI-RS_RP Note 2, Note 3  dBm / SCScsi-Rs						
		ND								
Parameter	Angle of arrival	NR operating bands		SCS <sub>CSI-RS</sub>	s = 60 kHz		SCS <sub>CSI-RS</sub> = 120 kHz	dB		
		Danus		UE Pow	er class	UE Power class	uв			
			1	2	3	4	1, 2, 3, 4			
		n257	- 128.3+Y <sub>1</sub>	-116.3	-112.1	- 127.8+Y <sub>4</sub>				
	Rx Beam	n258	- 128.3+Y <sub>1</sub>	-116.3	-112.1	- 127.8+Y <sub>4</sub>	(Value for	> 2		
Conditions	Peak	n260	- 125.3+Y <sub>1</sub>		-109.5	- 125.8+Y <sub>4</sub>	SCS <sub>CSI-RS</sub> = 60 kHz) +3dB	≥-3		
Conditions		n261	- 128.3+Y <sub>1</sub>	-116.3	-112.1	- 127.8+Y <sub>4</sub>				
	Spherical	n257	- 120.3+Z <sub>1</sub>	-105.3	-101.2	- 118.8+Z <sub>4</sub>	(Value for SCS <sub>CSI-RS</sub> = 60	≥-3		
	coverage Note 1		- 120.3+Z <sub>1</sub>	-105.3	-101.2	- 118.8+Z <sub>4</sub>	kHz) +3dB	≥-3		

	n260	- 117.3+Z <sub>1</sub>		-96.9	- 113.8+Z <sub>4</sub>	
	n261	- 120.3+Z <sub>1</sub>	-105.3	-101.2	- 118.8 <b>+</b> Z₄	

- Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
- Note 2: Values specified at the Reference point to give minimum CSI-RS Ês/lot, with no applied noise.
- Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.4.2-2:

- The value of Y for Power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

# B.2.5 Conditions for RRC connection release with redirection to NR

This clause defines the following conditions for RRC connection release with redirection to NR: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.5-1 for FR1 NR cells.

The conditions are defined in Table B.2.5-2 for FR2 NR cells.

Table B.2.5-1: Conditions for for RRC connection release with redirection to NR in FR1

		Minimum	SSB_RP	SSB Ês/lot
Parameter	NR operating band groups Note1	dBm / S	SCS <sub>SSB</sub>	dB
		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	uБ
	NR_FDD_FR1_A, NR_TDD_FR1_A	-125	-122	
	NR_FDD_FR1_B	-124.5	-121.5	
	NR_TDD_FR1_C	-124	-121	
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	≥ -4
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120	
	NR_FDD_FR1_G	-122	-119	
	NR_FDD_FR1_H	-121.5	-118.5	
NOTE 1: NF	R operating band groups are defined in clause	3.5.2.		

Table B.2.5-2: Conditions for RRC connection release with redirection to NR in FR2

				Minimum SSB_RP Note 2, Note 3						
		NR operating		dBm / SCS <sub>SSB</sub>						
Parameter	Angle of arrival			SCS <sub>SSB</sub> =	: 120 kHz		SCS <sub>SSB</sub> = 240 kHz	dB		
		bands		UE Pow	er class		UE Power class	uБ		
			1	2	3	4	1, 2, 3, 4			
	Rx Beam	n257	- 126.3+Y <sub>1</sub>	-114.3	-110.1	- 125.8+Y <sub>4</sub>		≥-4		
		n258	- 126.3+Y <sub>1</sub>	-114.3	-110.1	- 125.8+Y <sub>4</sub>	SCSssb = 120 kHz) +3dB			
	Peak	n260	- 123.3+Y <sub>1</sub>		-107.5	- 123.8+Y <sub>4</sub>				
Conditions		n261	- 126.3+Y <sub>1</sub>	-114.3	-110.1	- 125.8+Y <sub>4</sub>				
Conditions		n257	- 118.3+Z <sub>1</sub>	-103.3	-99.2	- 116.8+Z <sub>4</sub>				
	Spherical coverage	n258	- 118.3+Z <sub>1</sub>	-103.3	-99.2	- 116.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-4		
	Note 1	n260	- 115.3+Z <sub>1</sub>		-94.9	- 111.8+Z <sub>4</sub>	kHz) +3dB			
		n261	-114.3	-103.3	-99.2	- 116.8+Z <sub>4</sub>				

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB Ês/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.5.2-2:

- The value of Y for Power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

# B.2.6 Conditions for UE transmit timing

# B.2.6.1 Conditions for SSB based UE transmit timing

This clause defines the following conditions for UE transmit timing adjustment performed based on SSBs: SSB\_RP and SSB Ês/Iot and applicable for a corresponding operating band.

The conditions are defined in Table B.2.6.1-1 for FR1 SSB.

Table B.2.6.1-1: Conditions for SSB based UE transmit timing in FR1

		Minimum	SSB_RP	SSB Ês/lot
Parameter	NR operating band groups Note1	dBm /	SCS <sub>SSB</sub>	dB
		SCS <sub>SSB</sub> =15 kHz	SCS <sub>SSB</sub> =30 kHz	иь
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	
	NR_FDD_FR1_B	-123.5	-120.5	
Conditions	NR_TDD_FR1_C	-123	-120	> [ 2]
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	≥ [-3]
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1: NF	R operating band groups are defined in cla	ause 3.5.2.		

The conditions are defined in Table B.2.6.1-2 for FR2 SSB.

Table B.2.6.1-2: Conditions for SSB based UE transmit timing in FR2

				Minimum SSB_RP Note 2, Note 3						
		NR		dBm / SCS <sub>SSB</sub>						
Parameter	Angle of arrival	operating		SCS <sub>SSB</sub> =	: 120 kHz		SCS <sub>SSB</sub> = 240 kHz	4D		
		bands		UE Pow	er class		UE Power class	dB		
			1	2	3	4	1, 2, 3, 4			
		n257	- 125.3+Y <sub>1</sub>	-113.3	-109.1	- 124.8+Y <sub>4</sub>		≥[-3]		
	Rx Beam	n258	- 125.3+Y <sub>1</sub>	-113.3	-109.1	- 124.8+Y <sub>4</sub>	(Value for			
	Peak	n260	- 122.3+Y <sub>1</sub>		-106.5	- 122.8+Y <sub>4</sub>	$SCS_{SSB} = 120$ kHz) +3dB			
Conditions		n261	- 125.3+Y <sub>1</sub>	-113.3	-109.1	- 124.8+Y <sub>4</sub>				
Conditions		n257	- 117.3+Z <sub>1</sub>	-102.3	-98.2	- 115.8+Z₄				
	Spherical coverage Note 1	n258	- 117.3+Z <sub>1</sub>	-102.3	-98.2	- 115.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥[-3]		
		n260	- 114.3+Z <sub>1</sub>		-93.9	- 110.8+Z <sub>4</sub>	kHz) +3dB			
		n261	- 117.3+Z <sub>1</sub>	-102.3	-98.2	- 115.8+Z <sub>4</sub>				

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB Ês/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.6.1-2:

# B.2.6.2 Conditions for CSI-RS based UE transmit timing

This clause defines the following conditions for UE transmit timing adjustment based on CSI-RS: CSI-RS\_RP and CSI-RS Ês/Iot and applicable for a corresponding operating band.

The conditions are defined in Table B.2.6.2-1 for FR1 CSI-RS.

<sup>-</sup> The value of Y for Power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively

<sup>-</sup> The value of Z for Power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

Table B.2.6.2-1: Conditions for CSI-RS based UE transmit timing in FR1

	NP enerating	M	inimum CSI-RS RSR	P	CSI-RS Ês/lot
Parameter	NR operating band groups <sup>Note1</sup>		dBm / SCS <sub>CSI-RS</sub>		dB
	band groups	SCS <sub>CSI-RS</sub> =15 kHz	SCScsi-Rs=30 kHz	SCS <sub>CSI-RS</sub> =60 kHz	ub
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A,	-124	-121	-118	
	NR_SDL_FR1_A				≥ [-3]
	NR_FDD_FR1_B	-123.5	-120.5	-117.5	
	NR_TDD_FR1_C	-123	-120	-117	
Conditions	NR_FDD_FR1_D,	-122.5	-119.5	-116.5	
	NR_TDD_FR1_D	122.0	110.0	110.0	
	NR_FDD_FR1_E,	-122	-119	-116	
	NR_TDD_FR1_E	-122	-119	-110	
	NR_FDD_FR1_G	-121	-118	-115	
	NR_FDD_FR1_H	-120.5	-117.5	-114.5	
NOTE 1: NF	R operating band group	s are defined in claus	e 3.5.2.	·	

The conditions are defined in Table B.2.6.2-2 for FR2 CSI-RS.

Table B.2.6.2-2: Conditions for CSI-RS based UE transmit timing in FR2

				Minimum CSI-RS_RP Note 2, Note 3  dBm / SCScsi-Rs						
		NR operating bands								
Parameter	Angle of arrival			SCS <sub>CSI-RS</sub>	= 60 kHz		SCS <sub>CSI-RS</sub> = 120 kHz	dB		
				UE Pow	er class		UE Power class			
			1	2	3	4	1, 2, 3, 4			
		n257	- 128.3+Y <sub>1</sub>	-116.3	-112.1	- 127.8+Y <sub>4</sub>		≥[-3]		
	Rx Beam	n258	- 128.3+Y <sub>1</sub>	-116.3	-112.1	- 127.8+Y <sub>4</sub>	(Value for SCScsi-Rs = 60			
	Peak	n260	- 125.3+Y <sub>1</sub>		-109.5	- 125.8+Y <sub>4</sub>	kHz) +3dB			
Conditions		n261	- 128.3+Y <sub>1</sub>	-116.3	-112.1	- 127.8+Y <sub>4</sub>				
Conditions		n257	- 120.3+Z <sub>1</sub>	-105.3	-101.2	- 118.8+Z <sub>4</sub>				
	Spherical coverage Note 1	n258	- 120.3+Z <sub>1</sub>	-105.3	-101.2	- 118.8+Z <sub>4</sub>	(Value for SCScsi-Rs = 60	~L 21		
		n260	- 117.3+Z <sub>1</sub> -96.9		- 113.8+Z <sub>4</sub>	kHz) +3dB	≥[-3]			
		n261	- 120.3+Z <sub>1</sub>	-105.3	-101.2	- 118.8+Z <sub>4</sub>				

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum CSI-RS Ês/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.6.2-2:

- The value of Y for Power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1, 2 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1, 2, 3 and 4 respectively

# B.3 RRM Requirements Exceptions

# B.3.1 Introduction

Annex B.3 covers exceptions for side conditions based on receiver sensitivity for CA, DC, and SUL.

# B.3.2 Receiver sensitivity relaxation for CA

# B.3.2.1 Receiver sensitivity relaxation for UE supporting CA in FR1

For a UE supporting inter-band carrier aggregation configuration with uplink in NR band, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c}>0$  dB as defined in clause 7.3A.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

For a UE supporting CA configuration in FR1, the requirement in this clause applies for both SC and CA operation.

# B.3.2.2 Receiver sensitivity relaxation for UE configured with CA in FR1

# B.3.2.2.1 Inter-band carrier aggregation

For a UE configured with inter-band carrier aggregation with active uplink in NR band, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c}>0$  dB as defined in clause 7.3A.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

# B.3.2.2.2 Reference sensitivity exceptions due to UL harmonic interference for CA

In this clause, requirements exceptions are described for the UE configured with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same CA configuration.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta$ =L2-L1, where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3A.4 of TS 38.101-1 [18], when the following conditions are fulfilled,

- corresponding downlink component carriers on different NR bands are configured with CA and active,
- the upling is configured in the NR low operating band and is active,
- the uplink configuration is as specified in clause 7.3A.4 of TS 38.101-1 [18], and
- the exception requirements specified in clause 7.3A.4 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

# B.3.2.2.3 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

In this clause, requirements exceptions are described for the UE with an inter-band carrier aggregation with uplink assigned to two NR bands.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta$ =L2-L1, where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3A.5 of TS 38.101-1 [18], when the following conditions are fulfilled,

- corresponding downlink component carriers on different bands are configured with CA and active,
- uplinks are assigned to two NR bands,
- the exception requirements specified in clause 7.3A.5 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

# B.3.2.3 Receiver sensitivity relaxation for UE supporting CA in FR2

Editor's note: TBD

# B.3.2.4 Receiver sensitivity relaxation for UE configured with CA in FR2

# B.3.2.4.1 Intra-band contiguous carrier aggregation

For a UE configured with intra-band contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity  $\Delta R_{IB}>0$  dB as defined in clause 7.3A.2.1 of TS 38.101-2 [19] depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB}$  defined for the corresponding downlink NR bands.

# B.3.2.4.2 Intra-band non-contiguous carrier aggregation

For a UE configured with intra-band non-contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity  $\Delta R_{IB}>0$  dB as defined in clause 7.3A.2.1 of TS 38.101-2 [19] depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB}$  defined for the corresponding downlink NR bands.

# B.3.3 Receiver sensitivity relaxation for DC

Editor's note: TBD

# B.3.4 Receiver sensitivity relaxation for SUL

# B.3.4.1 Receiver sensitivity relaxation for UE supporting SUL in FR1

For a UE supporting a SUL configuration in FR1, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c}>0$  dB as defined in clause 7.3C.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

For a UE supporting a SUL configuration in FR1, the requirement in this clause applies for both SC and SUL operation.

# B.3.4.2 Receiver sensitivity relaxation for UE configured with SUL in FR1

# B.3.4.2.1 Reference sensitivity exceptions due to UL harmonic interference for SUL

In this clause, requirements exceptions are described for the UE with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same SUL configuration.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta$ =L2-L1, where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3C.2 of TS 38.101-1 [18], when the following conditions are fulfilled,

- a downlink component carrier is configured in NR band and is active,
- the upling is configured in the NR low operating band and is active,
- the uplink configuration is as specified in clause 7.3C.2 of TS 38.101-1 [18], and
- the exception requirements specified in clause 7.3C.2 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.4.1 should not be applied.

# Annex C (informative): Change history

						Change history	
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-05	RAN4#83	R4-1706324				Specification skeleton	0.0.1
2017-09						Email approved	0.1.0
2017-09	RAN4-NR AH #3	R4-1709413				Capture TPs approved in the meeting	0.2.0
2017-10	RAN4#84 -Bis	R4-1711985				Capture TPs approved in the meeting	0.3.0
2017-12	RAN4#85	R4-1714546				Capture TPs approved in RAN4#85	0.4.0
2017-12	RAN#78	RP-172407				v1.0.0 submitted for plenary approval	1.0.0
2017-12	RAN#78					Approved by plenary – Rel-15 spec under change control	15.0.0
2018-03	RAN#79	RP-180264	0032		В	CR to TS38.133	15.1.0
2018-06	RAN#80	RP-181075	0037		В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4 #86bis and RAN4 #87	15.2.0
2018-09	RAN#81	RP-181896	0043		В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4-AH-1807 and RAN4 #88	15.3.0
2018-12	RAN#82	RP-182763	0057	3	В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4-88bis and RAN4-89	15.4.0
2019-03	RAN#83	RP-190569	0064	1	В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#90	15.5.0
2019-06	RAN#84	RP-191240	0072	1	F	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#90bis and RAN4#91	15.6.0

# History

	Document history						
V15.2.0	July 2018	Publication					
V15.3.0	October 2018	Publication					
V15.4.0	April 2019	Publication					
V15.5.0	July 2019	Publication					
V15.6.0	July 2019	Publication					