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TECHNICAL SPECIFICATION

**5G;
5GS;
User Equipment (UE) conformance specification;
Part 3: Protocol Test Suites
(3GPP TS 38.523-3 version 15.0.0 Release 15)**

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Contents

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.

The present document is part 3 of a multi-part deliverable covering the 5G System (5GS) User Equipment (UE) protocol conformance specification, as identified below:

- 3GPP TS 38.523-1 [8]: "5GS; User Equipment (UE) conformance specification; Part 1: Protocol".

- 3GPP TS 38.523-2 [9]: "5GS; User Equipment (UE) conformance specification; Part 2: Applicability of protocol test cases".

- **3GPP TS 38.523-3: "5GS; User Equipment (UE) conformance specification; Part 3: Protocol Test Suites"** (the present document).

1   Scope

The present document specifies the protocol and signalling conformance testing in TTCN-3 for the 3GPP UE connecting to the 5G System (5GS) via its radio interface(s).

The following TTCN test specification and design considerations can be found in the present document:

-      the test system architecture;

-      the overall test suite structure;

-      the test models and ASP definitions;

-      the test methods and usage of communication ports definitions;

-      the test configurations;

-      the design principles and assumptions;

-      TTCN styles and conventions;

-      the partial PIXIT proforma;

-      the test suites.

The Test Suites designed in the document are based on the test cases specified in prose in 3GPP TS 38.523-1 [8]. The applicability of the individual test cases is specified in 3GPP TS 38.523-2 [9].

The present document is valid for TTCN development for 5GS UE conformance test according to 3GPP Releases starting from Release 15 up to the Release indicated on the cover page of the present document.

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 TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[3]   ISO/IEC 9646-7: "Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

[4]   ETSI ES 201 873: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3".

[5]   3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment".

[6]   3GPP TS 38.508-2: "5GS; User Equipment (UE) conformance specification; Part 2: Common Implementation Conformance Statement (ICS) proforma".

[7]   3GPP TS 38.509: "5GS; Special conformance testing functions for User Equipment (UE)".

[8]   3GPP TS 38.523-1: "5GS; User Equipment (UE) conformance specification; Part 1: Protocol".

[9]   3GPP TS 38.523-2: "5GS; User Equipment (UE) conformance specification; Part 2: Applicability of protocol test cases".

[10]   3GPP TS 36.508: "Common test environments for User Equipment (UE) conformance testing".

[11]   3GPP TS 36.509: "Terminal logical test interface; Special conformance testing functions".

[12]   3GPP TS 36.523-3: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 3: Test suites".

[13]   3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[14]   3GPP TS 38.322: "NR; Radio Link Control (RLC) protocol specification".

[15]   3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[16]   3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[17]   3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[18]   3GPP TS 24.301: "Non-Access-Stratum (NAS) Protocol for Evolved Packet System (EPS); Stage 3".

[19]   3GPP TS 38.211: "NR; Physical channels and modulation".

[20]   3GPP TS 38.212: "NR; Multiplexing and channel coding".

[21]   3GPP TS 38.213: " NR; Physical layer procedures for control"

[22]   3GPP TS 38.214: "NR; Physical layer procedures for data".

[23]   3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation".

3   Definitions, symbols and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

In addition for the purposes of the present document, the following terms, definitions, symbols and abbreviations apply:

-    such given in ISO/IEC 9646-1 [2] and ISO/IEC 9646-7 [3]

NOTE: Some terms and abbreviations defined in [2] and [3] are explicitly included below with small modification to reflect the terminology used in 3GPP.

Implementation eXtra Information for Testing (IXIT): A statement made by a supplier or implementer of an UEUT which contains or references all of the information (in addition to that given in the ICS) related to the UEUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the UEUT.

IXIT proforma: A document, in the form of a questionnaire, which when completed for an UEUT becomes an IXIT.

Protocol Implementation Conformance Statement (PICS): An ICS for an implementation or system claimed to conform to a given protocol specification.

Protocol Implementation eXtra Information for Testing (PIXIT): An IXIT related to testing for conformance to a given protocol specification.

3.2 Symbols

No specific symbols have been identified so far.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ASP	Abstract Service Primitive
ATS	Abstract Test Suite
DL	Downlink
EN-DC	E-UTRA-NR Dual Connectivity
EPC	Evolved Packet Core
ICS	Implementation Conformance Statement
IUT	Implementation Under Test
IXIT	Implementation eXtra Information for Testing
LSB	Least Significant Bit
MSB	Most Significant Bit
RAT	Radio Access Technology
SS	System Simulator
TC	Test Case
UL	Uplink
UT	Upper Tester

4 Test system architecture

4.1 General system architecture

The architecture specified in TS 36.523-3 [12] subclause 4.1.1 applies to the present document.

4.2 Component architecture

The architecture specified in TS 36.523-3 [12] subclause 4.1.2 applies to the present document, with NR RAT as another separate TTCN-3 parallel component.

5 Test models

5.1 EN-DC

5.1.1 Layer 3
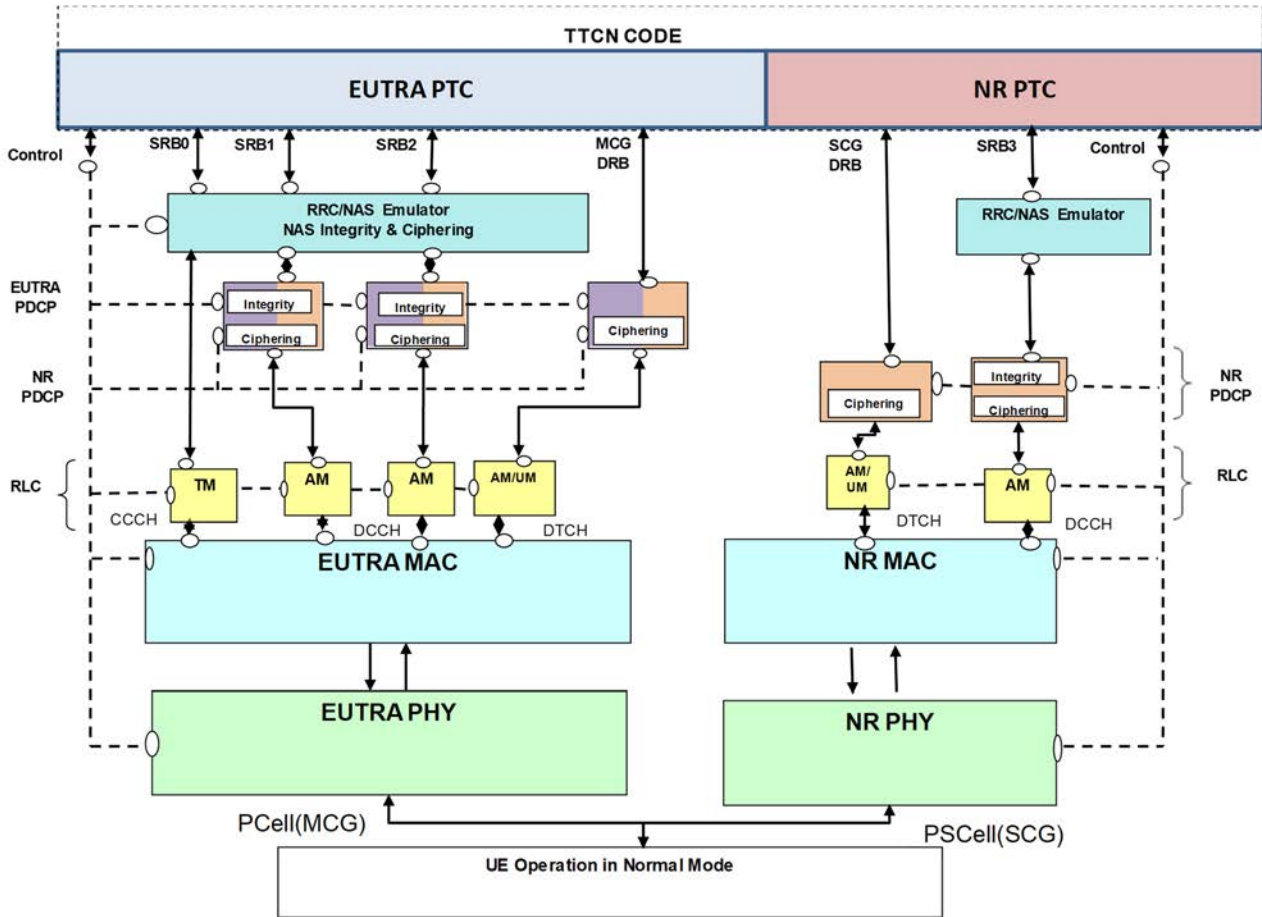
Figure 5.1.1-1: Test model for EN-DC Layer3 testing (*MCG and SCG*)
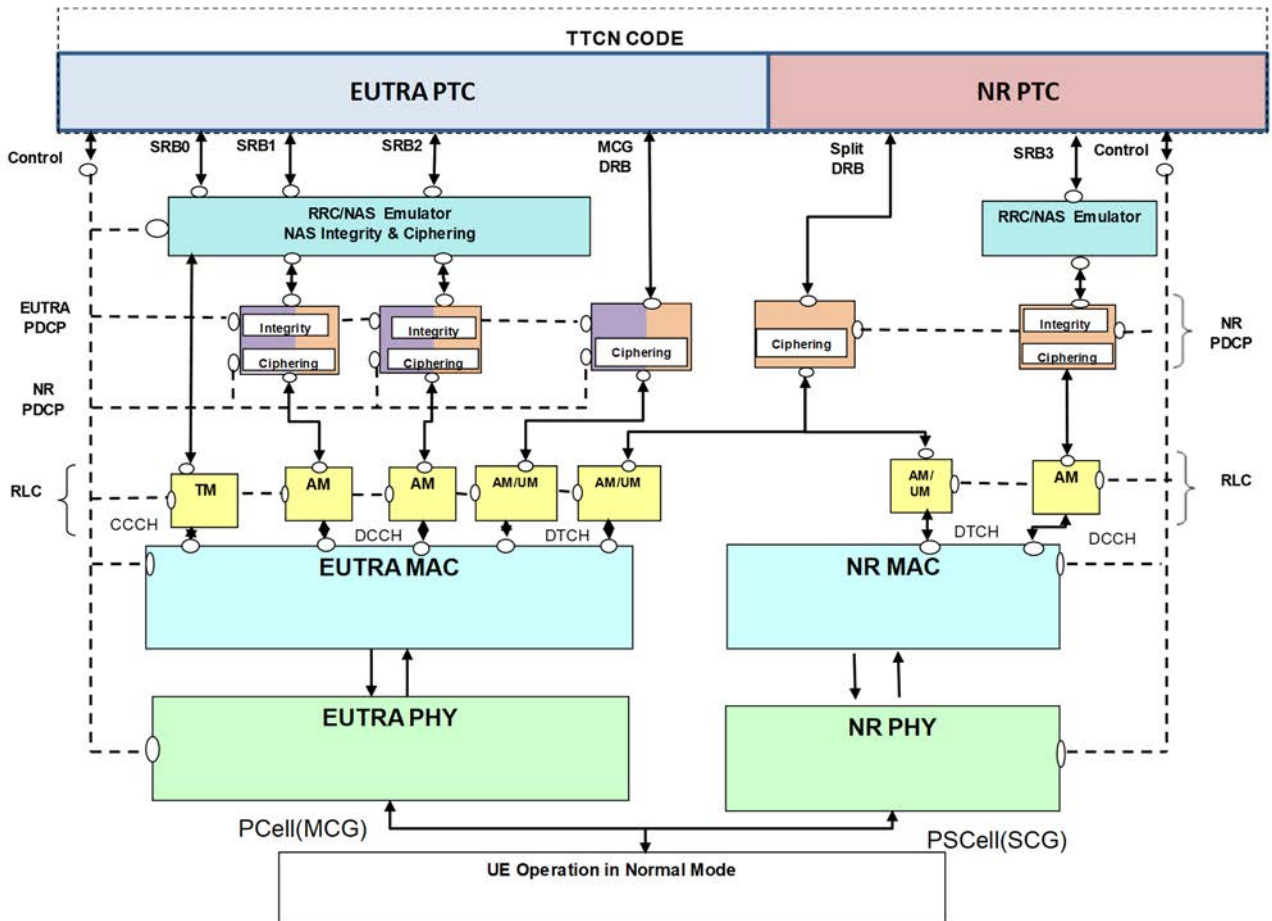
Figure 5.1.1-2: Test model for EN-DC Layer3 testing (*MCG and SN terminated split DRB*)
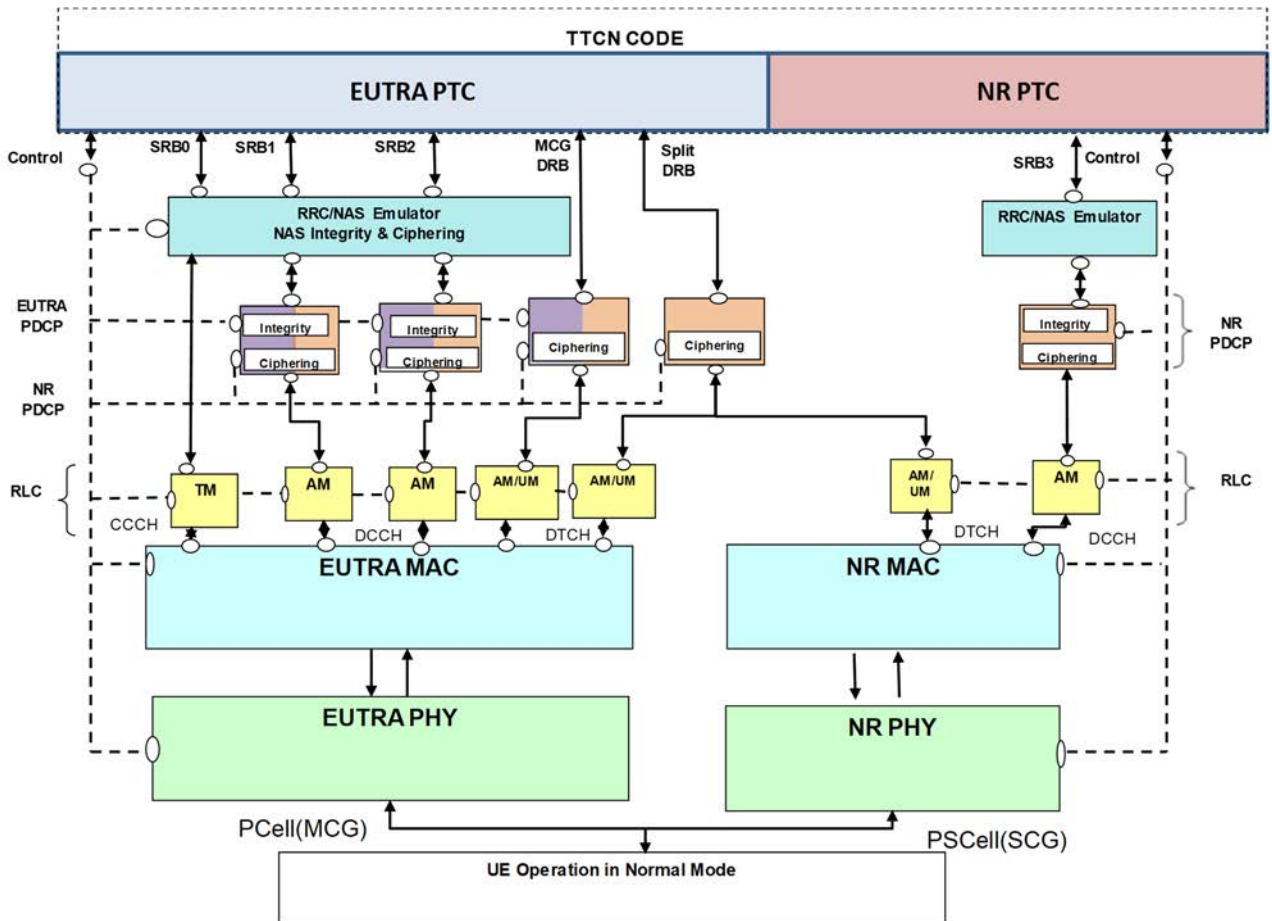
Figure 5.1.1-3: Test model for EN-DC Layer3 testing (*MCG and MN terminated split DRB*)
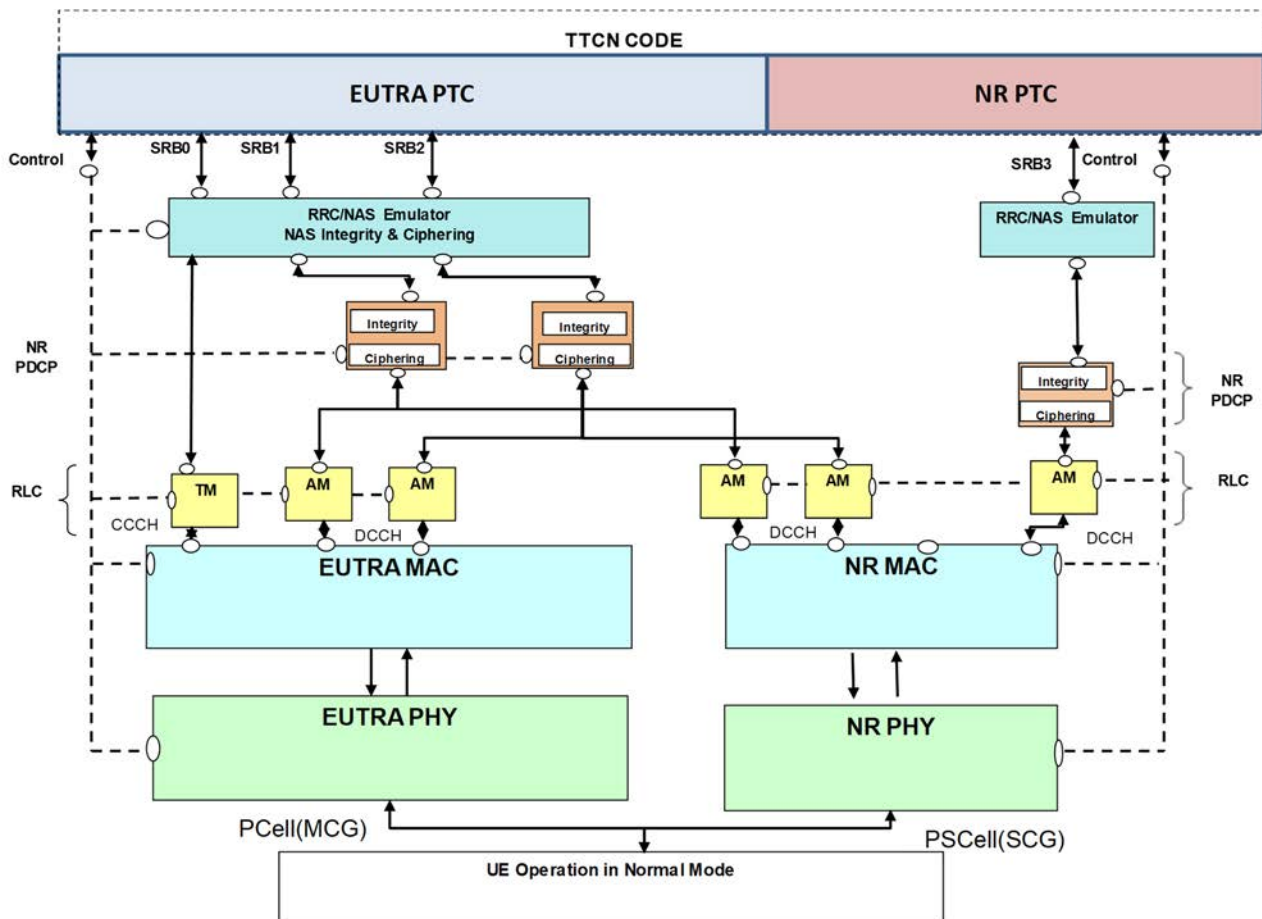
Figure 5.1.1-4: Test model for EN-DC Layer3 testing (*Split SRB(s)*, DRBs removed for clarity)

The UE is configured in normal mode. On the UE side Ciphering and Integrity (PDCP and NAS) are enabled and ROHC is not configured.

On the SS Side L1, MAC and RLC (EUTRA/NR) and PDCP (EUTRA/NR) are configured in normal way and shall perform all their functions. SRB0, 1 & 2 are configured only in EUTRA. For SRB0 the DL and UL port is above RLC. For SRB1 and SRB2 the port is above/below the EUTRA RRC and NAS emulator, which is implemented as a parallel test component. For DRB, the port is above PDCP. PDCP Ciphering/Integrity is enabled. NAS integrity/Ciphering is enabled.

> NOTE: PDCP (EUTRA/NR) is always configured in the EUTRA PTC for SRB1 & 2.

The EUTRA RRC/NAS emulator for SRB1 and SRB2 shall provide the Ciphering and Integrity functionality for the EPS NAS messages. In UL direction, SS shall report RRC messages, still containing (where appropriate) the secure and encoded NAS message, to the RRC port. In DL, RRC and NAS messages with same timing information shall be embedded in one PDU after integrity and ciphering for NAS messages.

SRB3 is connected directly to the SRB port in the NR PTC/dummy NR RRC/NAS emulator.

The NR PDCP can be configured in either the EUTRA or NR PTC for one or more SRBs or DRBs. If NR PDCP is configured, the bearer can be split. In this case the PDCP will be fully configured on the cell upon which the bearer is terminated and the other PTC will be configured with a proxy PDCP. Data shall be sent/received only on the PTC upon which the bearer is terminated. The SS shall route data to/from either cell, via the routing information provided.

5.1.2 Layer 2

5.1.2.1 PDCP
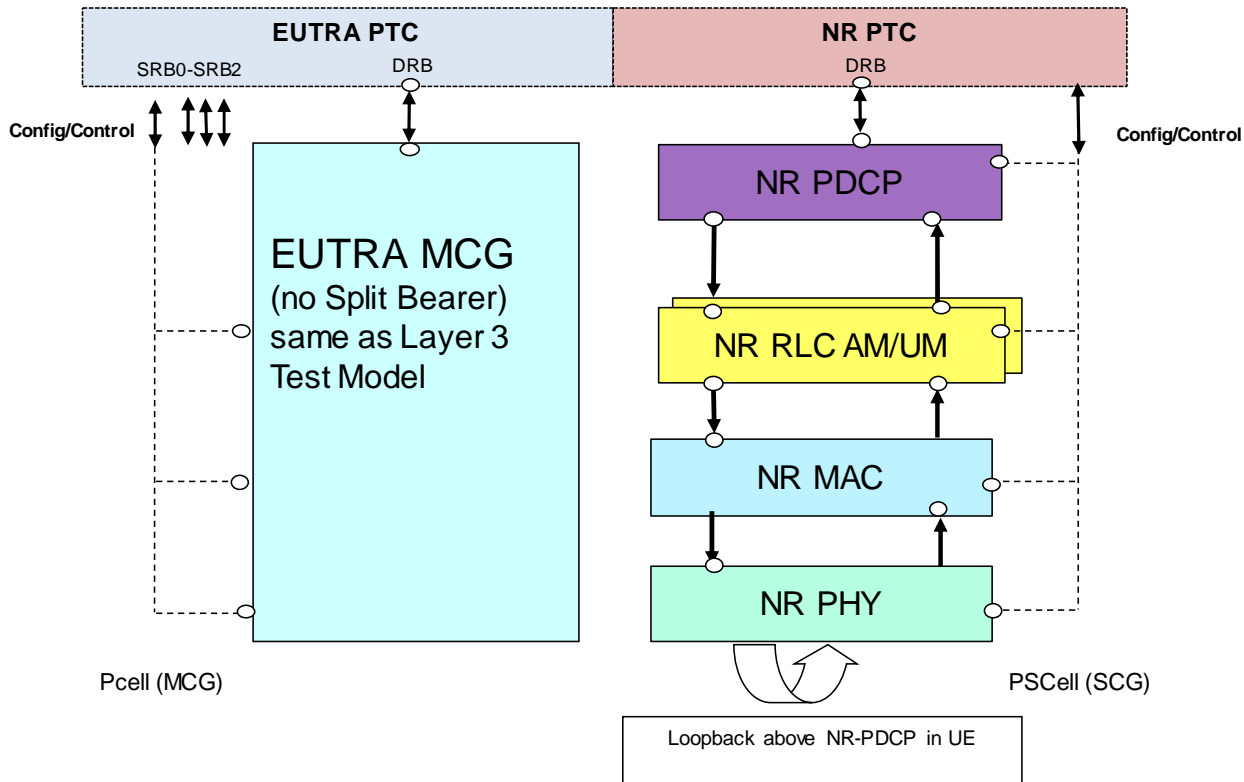
Figure 5.1.2.1-1: Test model for EN-DC PDCP testing (*MN terminated MCG DRB and SN terminated SCG DRB*)
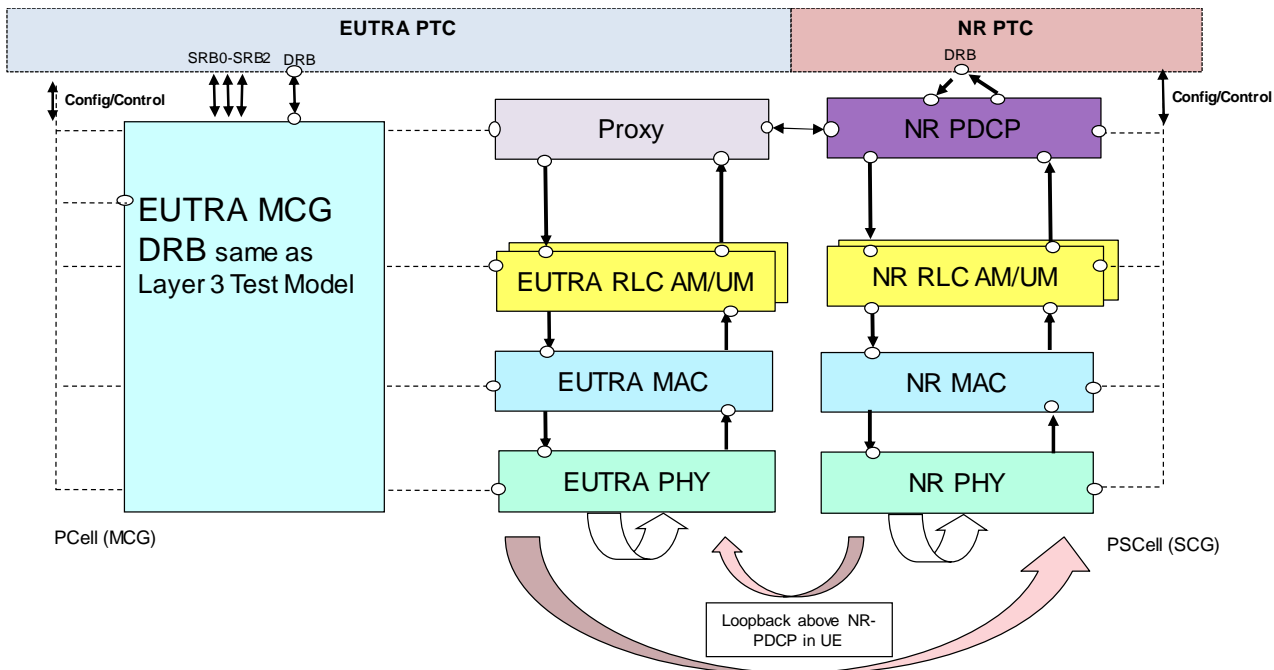
Figure 5.1.2.1-2: Test model for EN-DC PDCP testing (*MN terminated MCG DRB and SN terminated split DRB*)

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled as null algorithm and ROHC is not configured.

Test Loop Mode can be active on SN terminated SGC DRB as shown in Figure 5.1.2.1-1 or active on SN terminated split DRB as shown in Figure 5.1.2.1-2.

NOTE: Test loop Mode activation on MN terminated DRB with NR-PDCP is not considered in Figure 5.1.2.1-2.

On the SS NR, Layer 1, MAC and RLC is configured in the normal operation. The PDCP is configured in a special mode, where SS does not add any PCDP headers in DL and/or not remove any PDCP headers in UL directions respectively at DRB port on the NR PTC. The TTCN maintains sequence numbers and state variables for the PDCP layer.

On the SS Side the EUTRA MCG layer 1, MAC, RLC is configured test model in normal operation. They shall perform their functions. In case of split DRB, PDCP layer is configured as Proxy mode, TTCN shall configure EUTRA for EN-DC PDCP testing only when a Test Loop Mode is active on an SN terminated split DRB.

The SS shall route DL PDCP PDUs from TTCN to PCell and/or PSCell and SS shall indicate that the UL PDCP PDU is received from PCell or PSCell.

Duplication function:

- DL is FFS.

- UL SS shall include routing information for each UL PDCP PDU.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception over system indication port, if configured.

5.1.2.2   RLC
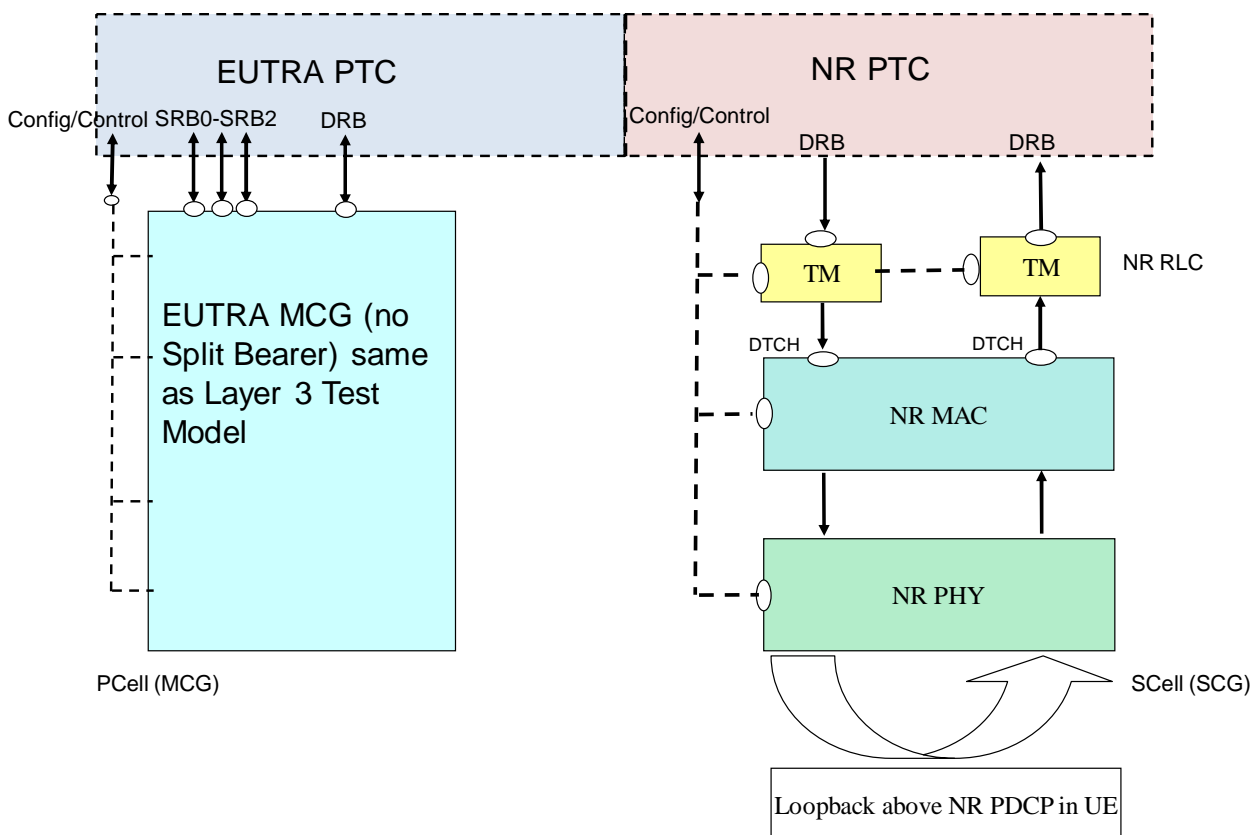
Figure 5.1.2.2-1: Test model for EN-DC RLC AM/UM testing

The PCell is an EUTRA Cell and PSCell is an NR cell on which testing happens. The UE is registered in EUTRA, using SRBs 0-2, and configured for EN-DC operation.

This model is suitable for testing both UM/AM mode of operation of DRBs on UE side.

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled (since mandatory) but with dummy ciphering algorithm, which is equivalent to not using ciphering. ROHC is not configured on UE Side.

On the SS Side, L1 and MAC are configured in the normal way. The RLC of the SCG DRBs is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no PDCP configured on SS NR PTC side. The ports are directly above RLC.

The PDUs, exchanged between TTCN and SS, shall be the final RLC PDUs consisting of RLC and PDCP headers. TTCN code shall take care in DL of building RLC headers and PDCP headers and in UL handle RLC and PDCP headers. TTCN code shall take care of maintaining sequence numbers and state variables for RLC and PDCP layers. If RLC on UE side is in AM mode, TTCN shall take care of generating polls in DL and responding with RLC control PDUs on reception of UL Poll.

5.1.2.3 MAC
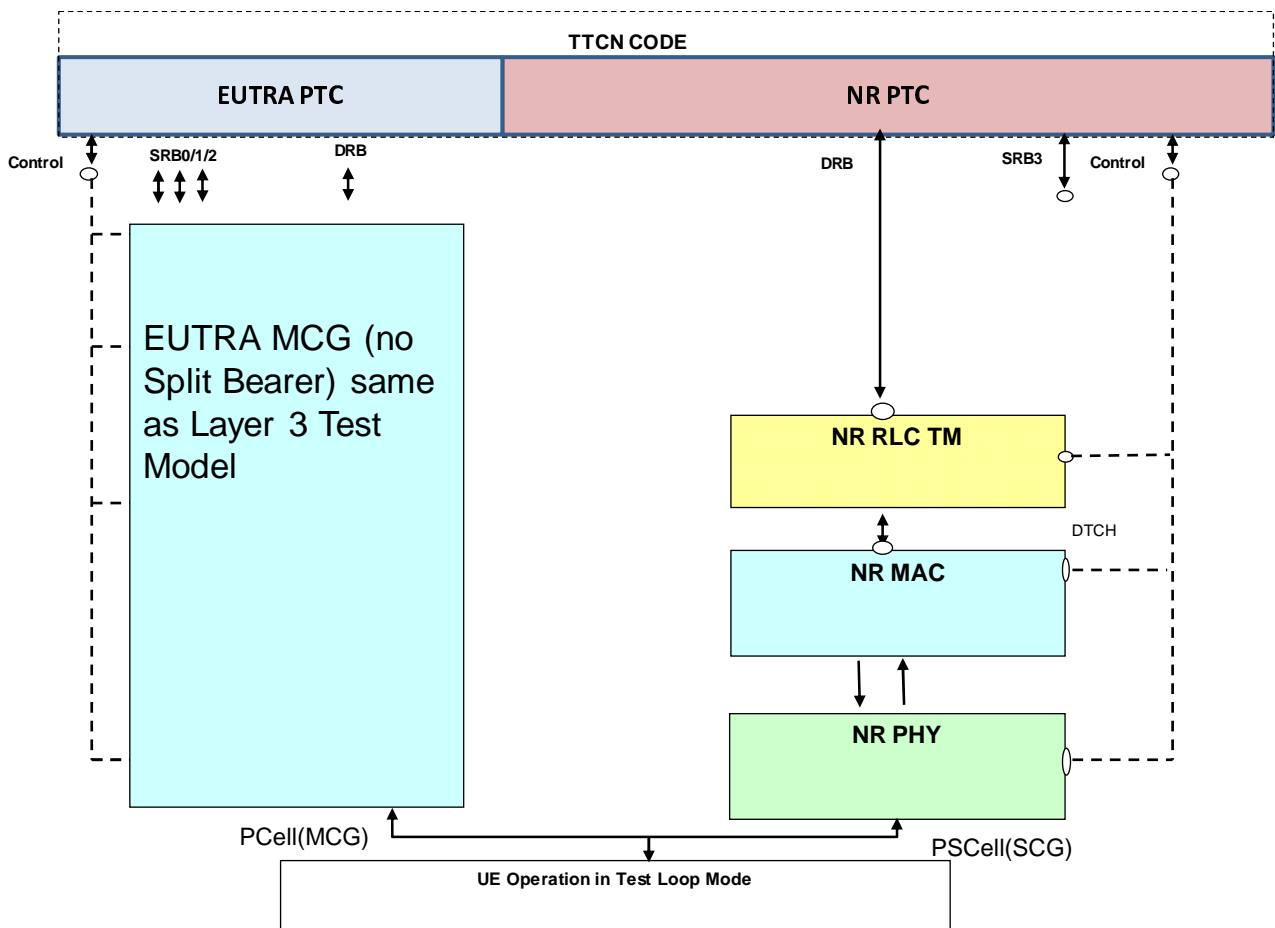
Figure 5.1.2.3-1: Test model for EN-DC MAC testing

The UE is configured in Test Loop Mode, to loop back the User Plane data above PDCP layer. On UE side Ciphering is enabled (since Mandatory) but with dummy ciphering algorithm, which is equivalent to not using ciphering. ROHC is not configured on UE Side.

On the SS Side the EUTRA MCG is configured as per the EN-DC Layer 3 test model in normal operation. The EN-DC MAC test model expects no split bearers to be configured.

On the SS NR, Layer 1 is configured in the normal way. NR MAC is configured in a special mode, where it does not add any MAC headers in DL and /or not remove any MAC headers in UL directions respectively at DRB port. In this case, the TTCN shall provide the final MAC PDU, including padding. Except for this, the NR MAC layer shall perform all its other functions. SRB3 if present is configured as in Layer 3 test model in normal operation.

On DRBs the NR RLC is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no NR PDCP configured on SS Side. The ports are directly above NR RLC.

There are two different test modes in which NR MAC header addition/removal can be configured:

1. DL/UL header-transparent mode: no header addition in DL and no header removal in UL.

2. DL only header-transparent mode: no header addition in DL; UL NR MAC is configured in normal mode to remove MAC header and de-multiplex the MAC SDUs according to the logical channel Ids.

If SS NR MAC is configured in DL/UL header-transparent mode, the PDUs, exchanged at the DRB port between TTCN and SS, shall be the final MAC PDUs consisting of MAC, RLC and PDCP headers. TTCN code shall take care in DL of building MAC header, RLC headers and PDCP headers and in UL handle MAC, RLC and PDCP headers. TTCN code shall take care of maintaining sequence numbers and state variables for RLC and PDCP layers. During testing of multiple DRBs at the UE side, it shall still be possible to configure only one DRB on SS side with configuration in the figure 5.1.2.3-1. Other DRBs will not be configured, to facilitate routing of UL MAC PDUs. Multiplexing/de-multiplexing of PDUs meant/from different DRBs shall be performed in TTCN. Since the MAC layer does not evaluate the MAC headers in UL it cannot distinguish between SRB and DRB data in UL. There shall be no SRB3 traffic while MAC is configured in this test mode. The SS MAC shall take care of automatic repetitions/retransmission in UL and DL, based on normal MAC HARQ behaviour.

If SS NR MAC is configured in DL only header-transparent mode, the UL PDUs exchanged at the DRB port between TTCN and SS, shall be final RLC PDUs consisting of RLC and PDCP headers. SS shall route these PDUs based on logical channel IDs. In DL, TTCN sends fully encoded MAC PDUs at the DRB port (consisting of MAC, RLC and PDCP headers). In this case TTCN needs to take care of maintaining sequence numbers and state variables for RLC and PDCP layers. Furthermore, in UL and DL the SS MAC layer shall be capable of dealing with SRB3 data (i.e. it shall handle DL RLC PDUs coming from SRB3 RLC layer or de-multiplex UL RLC PDUs to SRB3) as in normal mode. The SS MAC shall take care of automatic repetitions/retransmissions in UL and DL, based on normal MAC HARQ behaviour. TTCN shall ensure that no DL MAC SDUs in normal mode and DL MAC PDUs in test mode are mixed for the same TTI.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception over system indication port, if configured. In a similar way the reception of PRACH preambles is reported by SS over the same port.

6   System interface

6.1   Upper tester interface

The Upper Tester (UT) interface is the same as specified in TS 36.523-3 [12] clause 5.

6.2   Abstract system primitives

6.2.1   Introduction

The present subclause 6.2 specifies the abstract system primitives (ASPs) used on the system interface to configure and control the SS.

6.2.2   General requirements and assumptions

The requirements and assumptions specified in TS 36.523-3 [12] subclause 6.1 apply to the present document.

6.2.3   E-UTRAN ASP definitions

Please refer to TS 36.523-3 [12] subclause 6.2.

6.2.4   NR ASP definitions

See Annex D.

7   Test methods and design considerations

7.1   Common aspects

7.1.1   Introduction

Subclause 7.1 specifies test methods and design considerations that are common to all 5GS deployment options.

7.1.2   Physical layer aspects

7.1.2.1   Search spaces and DCI

7.1.2.1.1   Parameters

For each search space there are several parameters specifying the location of this search space in the time and frequency domain.

7.1.2.2.1.1   Search space configuration

PDCCH monitoring periodicity	
Comment/description	slot periodicity in time domain
L1 parameter name	monitoringSlotPeriodicityAndOffset
ASN.1 parameter	SearchSpace.monitoringSlotPeriodicityAndOffset
Core spec reference	TS 38.213 [21] clause 10.1
PDCCH monitoring offset	
Comment/description	slot offset
L1 parameter name	monitoringSlotPeriodicityAndOffset
ASN.1 parameter	SearchSpace.monitoringSlotPeriodicityAndOffset
Core spec reference	TS 38.213 [21] clause 10.1
PDCCH monitoring pattern	
Comment/description	first symbol(s) of the control resource set within a slot for PDCCH monitoring; in general a search space starts with first symbol of a slot; the duration is given by the L1 parameter 'CORESET-time-duration'
L1 parameter name	monitoringSymbolsWithinSlot
ASN.1 parameter	SearchSpace.monitoringSymbolsWithinSlot
Core spec reference	TS 38.213 [21] clause 10.1
CORESET time duration	
Comment/description	Duration of a search space in time domain: 1, 2 or 3 symbols
L1 parameter name	CORESET-time-duration (TS 38.213)
ASN.1 parameter	ControlResourceSet.duration
Core spec reference	TS 38.213 [21] clause 10.1
CORESET frequency domain allocation	
Comment/description	Bitmap specifying the frequency domain allocation of a search space NOTE: The allocations needs to fit into the BWP to which the CORESET belongs
L1 parameter name	CORESET-freq-dom
ASN.1 parameter	ControlResourceSet.frequencyDomainResources
Core spec reference	TS 38.213 [21] clause 10.1, TS 38.211 [19] clause 7.3.2.2

7.1.2.1.2   PDCCH search spaces

For each configured DL BWP, the TTCN may configure one or several search spaces.

For each search space, TTCN configures the SS with:

- the configuration of this search space as given to the UE, enabling the SS to determine the PDCCH transmission occasions (same as the UE PDCCH monitoring occasions) and associated CORESET,

- the CCE aggregation level *L* that the SS shall use for PDCCH transmission on this search space,

- the priority *P* of this search space that the SS shall consider in its PDCCH candidate selection algorithm.

   - a value of 0 represents the highest priority, a value of 1 the second highest priority and so on.

NOTE: "Search space" is used in terms of TS 38.213 [21] clause 10.1 and a single search space configuration (ASN.1 type 'SearchSpace') may contain several search spaces.

7.1.2.1.3   DCI formats

The SS shall support several DCI formats. For each 5GS option, the set of DCI formats to support may be different (see relevant option-specific subclauses).

The transmission of DCI formats may be explicitly requested from TTCN or semi-autonomously handled by the SS. In case of explicit request:

- If the associated timing information is explicit, the TTCN shall ensure that this timing information matches one of the configured PDCCH transmission occasions.

- If the associated timing information is now, the SS shall determine and use the next valid PDCCH transmission occasion.

7.1.2.1.4   PDCCH candidate selection

The SS shall consider search space priorities as configured by TTCN to find appropriate PDCCH candidates for scheduling of DCI formats in case of:

a) Overlapping search spaces:

   - Depending on system configuration and slot number candidates of the different search spaces may be located in same (or overlapping) CCEs.

      - Example: system information is automatically scheduled by the SS and UE-specific data transmission requires scheduling of PDCCH for the same slot and symbols

   => Candidates of the UE-specific search space may collide with actual PDCCH of a common search space (e.g. system information).

b) Within a search space if different search space types are mapped to the same search space configuration.

For every PDCCH assignment (in terms of TS 38.213 [21] clause 10.1) the SS shall apply the PDCCH candidate selection algorithm specified hereafter:

1) For each search space the SS selects the PDCCH candidate with index m(search space, L) = 0

With (see TS 38.213 [21] subclause 10.1):

   - candidate index m(search space, L) := 0 .. M(search space, L) - 1;

   - M(search space, L): number of PDCCH candidates per CCE aggregation level for the given search space;

   - L: CCE aggregation level

2) If there is an overlapping of the selected candidates, the SS shall:

   - keep the PDCCH candidate of the search space with higher priority *P*,

   - increment m for the search space with lower priority;

3) The SS shall repeat 2) until there is no overlapping anymore.

In the following cases the SS shall raise an error:

i) Collision of PDCCH candidates of search spaces with the same priority,

ii) When a DL transmission or a single UL grant is scheduled with specific TimingInfo and after applying the above rules there is no PDCCH candidate left anymore.
NOTE: For TimingInfo 'Now' there is no error as the SS can shift the transmission to the next PDCCH occasion

In case of continuous UL grant configuration, the SS shall not raise an error when a grant cannot be scheduled at a specific point in time but skip it, if the grant is configured to be at every occasion, or shift it to the next occasion otherwise.

7.1.2.2   Downlink resource allocation

7.1.2.2.1   Parameters

There are several parameters specifying the resource allocation on PDCCH (see subclause 7.1.2.2.1.1) and PDSCH for a DL transmission. The following sub-clauses summarise the parameters being most relevant for downlink resource allocation from the test model's point of view.

7.1.2.2.1.1   Time domain resource allocation pre-configured at the UE via RRC signalling

For time domain resource allocation, a table is preconfigured at the UE by PDSCH-Config.pdsch-TimeDomainAllocationList and/or by PDSCH-ConfigCommon.pdsch-TimeDomainAllocationList with PDSCH-Config overruling PDSCH-ConfigCommon (see TS 38.331 [16]). This table corresponds to L1 parameter "pdsch-symbolAllocation" and the entries are referred to by DCI.

pdsch-symbolAllocation has the following fields:

PDSCH slot offset (K_0)	
Comment/description	Slot offset of PDSCH transmission based on the corresponding PDCCH transmission (DCI) Assuming the same numerology for PDSCH and PDCCH: $K_0 = 0$ PDCCH and corresponding PDSCH transmission are in the same slot $K_0 > 0$ PDCCH and corresponding PDSCH transmission are in different slots
L1 parameter name	K_0
ASN.1 parameter	PDSCH-TimeDomainResourceAllocation.k0
Core spec reference	TS 38.214 [22] clause 5.1.2.1
PDSCH mapping type	
Comment/description	PDSCH mapping type A or B NOTE: In general - at least for early releases - type A is expected to be used by conformance testing (Type B seems to be intended for mini-slots)
L1 parameter name	Mapping-type NOTE: "Mapping-type" is referred in ASN.1 comment but not used/defined in TS 38.214
ASN.1 parameter	PDSCH-TimeDomainResourceAllocation.mappingType
Core spec reference	TS 38.214 [22] clause 5.1.2.1
Start and length indicator (SLIV)	
Comment/description	The SLIV specifies the starting symbol (S) and the number of symbols (L) of the PDSCH resource assignment according to TS 38.214 [22] clause 5.1.2.1; valid start/length combinations depend on the PDSCH mapping type
L1 parameter name	Index-start-len NOTE: "Index-start-len" is referred in ASN.1 comment but not used/defined in TS 38.214 where "SLIV" is used instead
ASN.1 parameter	PDSCH-TimeDomainResourceAllocation.startSymbolAndLength
Core spec reference	TS 38.214 [22] clause 5.1.2.1

7.1.2.2.1.2   Frequency domain resource allocation configured at the UE via RRC signalling

Resource allocation type	
Comment/description	Specifies the format of the frequency domain resource assignment field of DCI format 1_1 (resource allocation type 0, resource allocation type 1 or both) NOTE: for DCI format 1_0 this parameter seems to be not relevant.
L1 parameter name	Resource-allocation-config NOTE: "Resource-allocation-config" is referred in ASN.1 comment but not used/defined in TS 38.212 or TS 38.214
ASN.1 parameter	PDSCH-Config.resourceAllocation
Core spec reference	TS 38.212 [20] clause 7.3.1.2.2

7.1.2.2.1.3   DCI parameters

Frequency domain resource assignment	
Comment/description	Resource allocation type 0: bitmap indicating resource block groups (RBGs) being allocated to the UE Resource allocation type 1: resource indication value (RIV) indicating start and length of a set of contiguously allocated resource blocks NOTE: for DCI format 1_0 only resource allocation type 1 is applicable (according to TS 38.214 [22] clause 5.1.2.2)
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2, TS 38.214 [22] clause 5.1.2.2
Time domain resource assignment	
Comment/description	Index addressing pre-configured time domain resource allocation (see clause 7.1.2.2.1.1)
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2
VRB-to-PRB mapping	
Comment/description	To distinguish localised (non-interleaved) and distributed (interleaved) allocation of virtual resource blocks in case of resource allocation type 1
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2, TS 38.214 [22] clause 5.1.2.2
Modulation and coding scheme (MCS)	
Comment/description	Modulation and coding scheme according to TS 38.214 [22] clause 5.1.3: The DCI provides the MCS index (I_{MCS}) which refers to the respective tables in clause 5.1.3.1 of TS 38.214 [22]
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2, TS 38.214 [22] clause 5.1.3

7.1.2.2.2   Timing

The timing information provided by the request ASP for a DL transmission specifies the slot in which the DCI on PDCCH is transmitted scheduling the corresponding PDSCH transmission. The exact timing of the PDSCH transmission is depending on the parameters for time domain resource allocation as described in the previous clause. If the timing information specifies a specific slot it is up to TTCN that an appropriate search space is configured for this slot. The SS shall not schedule the DL transmission otherwise and may raise an error.

In case of TimingInfo indicating "Now" or "Any slot" it is up to the SS to find the appropriate slot for scheduling of the DCI. The SS shall not use slots in which SS/PBCH blocks are scheduled.
NOTE: The restriction for slots containing SS/PBCH can be removed when there is clarification in core specs (e.g. TS 38.214 [22]) how "rate matching around" SS/PBCH blocks is reflected in the calculation of the transport block size (see clause 7.1.2.2.4).

In case of TimingInfo not being "Now" TTCN shall ensure that the data is scheduled at least 100ms in advance. Furthermore, it is up to the test case prose to avoid any overlapping of PDSCH and PDCCH transmissions in time domain and it is up to TTCN implementation to address an appropriate slot for which the TBS size determination is well-defined according to clause 7.1.2.2.4; the SS shall raise an error otherwise.

Figures 7.1.2.2.2-1 and 7.1.2.2.2-2 illustrate the timing for $K_0 = 0$ and $K_0 > 0$.

pdsch-symbolAllocation pre-configured at the UE:

Index	K_0	Mapping type	SLIV
...	...	...	...
i	0	A	58
...	...	...	...

DCI:
Time domain resource assignment = i

PDCCH

| ... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | ... |

- $K_0 = 0$
- SLIV = 58 $\Rightarrow$ S = 2; L = 5

- PDCCH monitoring pattern:
  first symbol of the slot ('10000000000000'B)
- CORESET time duration: 2 symbols

slot n

Slot n:
- hosting search space according to PDCCH monitoring periodicity and offset (SearchSpace.monitoringSlotPeriodicityAndOffset)
- Addressed by TimingInfo

Figure 7.1.2.2.2-1: Example for time domain resource allocation for $K_0 = 0$
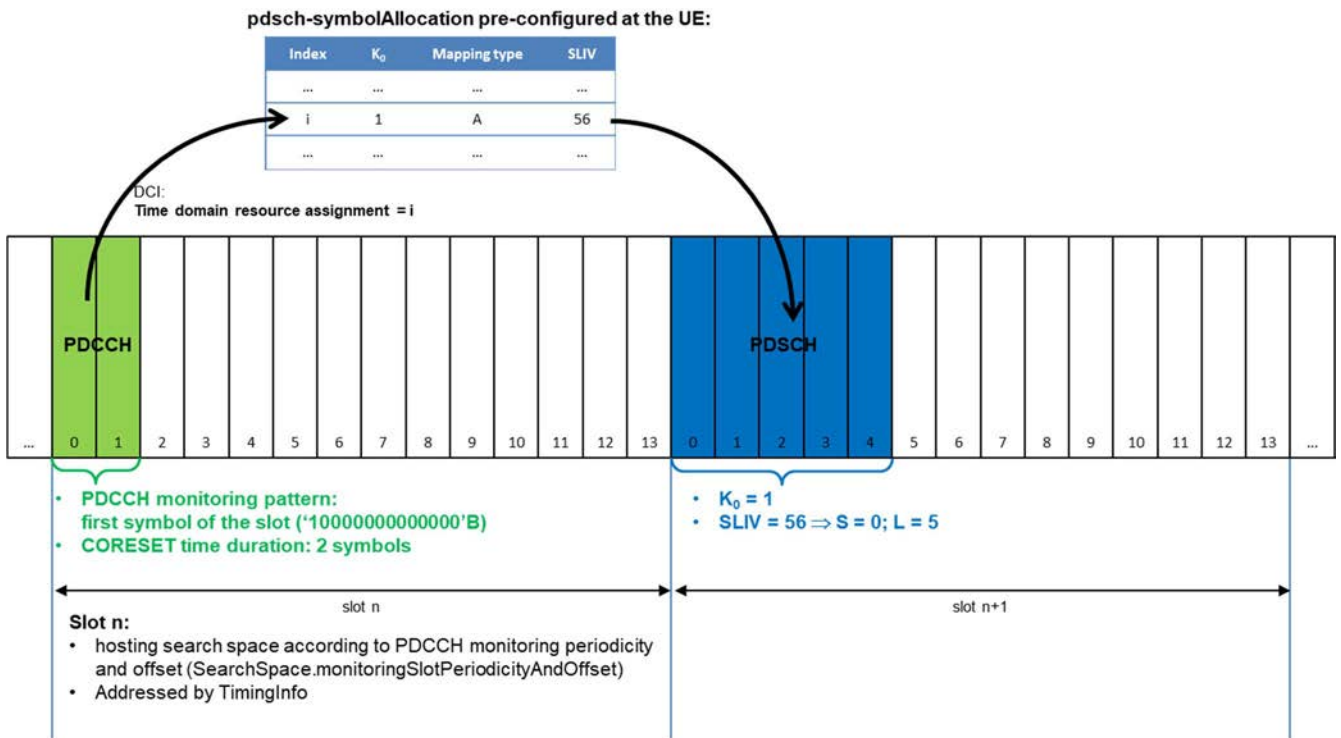
Figure 7.1.2.2.2-2: Example for time domain resource allocation for $K_0 > 0$

7.1.2.2.3   DL scheduling scheme

Different kinds of PDSCH transmissions need to be scheduled:

- System information (SI: SIB1 and other system information)

- Paging

- Random access response (RAR)

- DCCH/DTCH transmissions

The scheduling needs to be done so that there is no overlapping in frequency or time domain.

In general there are different ways to do the scheduling:

a) Multiplexing in frequency domain of a single BWP

b) Multiplexing in time domain of a single BWP (at slot or at symbol level)

c) Use of different BWPs: e.g. initial BWP for SI, RAR, Paging + dedicated BWP for DCCH/DTCH

d) Combinations of the above

In frequency domain the different kinds of PDSCH transmissions may use different resource allocation types (TS 38.214 [22] clause 5.1.2.2):

- Resource allocation (RA) type 0: Bitmap-based allocation of Resource Block Groups (RBGs):
  Applicable only for DCI format 1_1 $\Rightarrow$ not applicable for scheduling of SI, Paging and RAR

- Resource allocation (RA) type 1, non-interleaved: continuous allocation of RBs with one-by-one mapping of virtual resource blocks (VRBs) to physical resource blocks (PRBs).

- Resource allocation (RA) type 1, interleaved: continuous allocation of RBs with interleaved VRB-to-PRB mapping according to TS 38.211 [19] clause 6.3.1.7.

7.1.2.2.3.1 DL scheduling scheme: Frequency domain multiplexing, RA type1, non-interleaved

This scheduling scheme multiplexes the different kinds of PDSCH transmissions in the frequency domain of a single BWP by exclusively using resource allocation type 1 with non-interleaved VRB-to-PRB mapping. Assuming the resource blocks being numbered from 0 to N_{BWP}-1 (with N_{BWP} being the size of the BWP) the following allocation is done:

Table 7.1.2.2.3.1-1: Resource allocation for frequency domain multiplexing, RA type1, non-interleaved

Kind of PDSCH transmission (Note 1)	Resource block allocation (Note 2)	
	RB_{start}	$L_{RBs,max}$ (Note 2)
System information	0	5
Paging	5	1
Random access response (Note 3)	6	N_{BWP}-6
DCCH/DTCH transmissions (Note 3)	6	N_{BWP}-6
NOTE 1: In context of a generic 5G test model it is not relevant whether or not there is SI and Paging for a given deployment option (e.g. EN-DC).		
NOTE 2: $L_{RBs} \leq L_{RBs,max}$ with L_{RBs}: number of resource blocks being eventually used for a particular transmission.		
NOTE 3: Random access response and DCCH/DTCH transmissions are mutual exclusive and therefore share the same allocation		

In general PDCCH and corresponding PDSCH transmissions are in the same slot ($K_0 = 0$).

7.1.2.2.4 Transport block size determination

TS 38.214 [22] clause 5.1.3.2 describes the transport block size (TBS) determination from the UE's point of view: the UE calculates the TBS depending on several parameters. From a test model's point of view appropriate values need to be found for the parameters to achieve a given TBS.

There are two modes specified for DL scheduling:

- automatic mode

- explicit mode

In explicit mode all parameters for the TBS determination are provided by TTCN, i.e. it is up to the TTCN implementation to find proper values. In automatic mode TTCN only provides RB_{start} and $L_{RBs,max}$ and it is up to the SS to determine the values of L_{RBs} and I_{MCS} to achieve the TBS which is needed for a particular DL transmission.

The SS shall apply the rules as described in clause 7.1.2.2.4.2.

7.1.2.2.4.1 Parameters affecting TBS determination

The following parameters need to be considered for TBS determination:

Table 7.1.2.2.4.1-1: Parameters affecting TBS determination

Parameter	Comment/Description	Reference
Number of RBs in frequency domain	Indicated by DCI	Clause 7.1.2.2.1.3
Number of symbols in time domain	Pre-configured at UE, selected by DCI; corresponds to "PDSCH duration" TS 38.211 [19] clause 7.4.1.1.2	Clause 7.1.2.2.1.1
MCS index I_{MCS}	Indicated by DCI: Modulation Order Q_m, Target code Rate R	Clause 7.1.2.2.1.3; TS 38.214 [22] Table 5.1.3.1-1 and 5.1.3.1-2
Number of layers υ	In general $\upsilon = 1$ for signalling conformance tests	
L1 parameter MCS-Table-PDSCH	Pre-configured at the UE via RRC signalling: PDSCH-Config.mcs-Table := {qam64, qam256}; indicates which MCS table to be applied when DL transmission is scheduled with C-RNTI	TS 38.214 [22] clause 5.1.3.1
Number of REs per PRB	Number of REs per PRB which are applicable for the PDSCH transmission	Table 7.1.2.2.4.1-2
Rate matching	TS 38.214 [22] clause 5.1.3.2 does not specify how rate matching needs to be considered for TBS determination $\Rightarrow$ at least for early implementations slots containing SS/PBCH block transmission shall not be used for PDSCH transmissions and further rate matching is assumed not to be configured via RRC signalling	TS 38.214 [22] clause 5.1.4

Table 7.1.2.2.4.1-2: Parameters affecting number of REs allocated for PDSCH per PRB

Parameter	Comment/Description	Reference
PDSCH mapping type	Type A or B	Clause 7.1.2.2.1.1; TS 38.211 [19] clause 7.4.1.1.2
L1 parameter DL-DMRS-config-type	DMRS Configuration type 0 or 1 as indicated to the UE by DMRS-DownlinkConfig.dmrs-Type	TS 38.211 [19] clause 7.4.1.1.2
L1 parameter DL-DMRS-add-pos	Number of additional DMRS positions as indicated to the UE by DMRS-DownlinkConfig.dmrs-AdditionalPosition: 0, 1, 2 or 3 additional positions	TS 38.211 [19] clause 7.4.1.1.2 and tables 7.4.1.1.2-3/4
L1 parameter DL-DMRS-max-len	Number of OFDM symbols used for DMRS as indicated to the UE by DMRS-DownlinkConfig.maxLength: Single or double symbol DM-RS	TS 38.211 [19] clause 7.4.1.1.2 and table 7.4.1.1.2-5
L1 parameter Xoh-PDSCH	Number of REs used for additional overhead as indicated to the UE by PDSCH-ServingCellConfig.xOverhead: 0, 6, 12, 18 REs	TS 38.214 [22] clause 5.1.3.2
PDSCH duration	Number of symbols allocated for the PDSCH transmission	Clause 7.1.2.2.1.1

Table 7.1.2.2.4.1-3 gives examples for the position of DMRS within a resource block depending on different parameters, Table 7.1.2.2.4.1-4 shows the number of REs for DMRS and PDSCH per PRB for relevant PDSCH durations according to TS 38.211 [19] clause 7.4.1.1.2.

**Table 7.1.2.2.4.1-3: Examples for the position of DMRS in an RB with
PDSCH mapping type A, DMRS configuration type 1, DL-DMRS-max-len=1, DL-DMRS-typeA-pos=2**
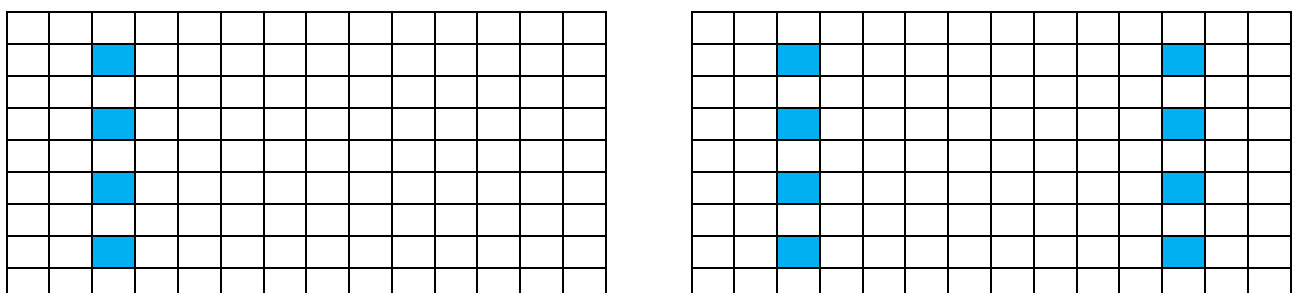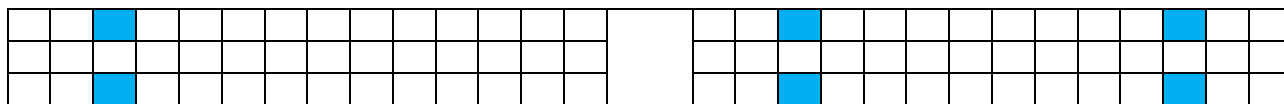
DL-DMRS-add-pos = 0:
k = 4n + 2k'; k' = 0, 1
l_0 = 2

DL-DMRS-add-pos = 1, PDSCH duration = 13, 14:
k = 4n + 2k'; k' = 0, 1
l_0 = 2, l_1 = 11
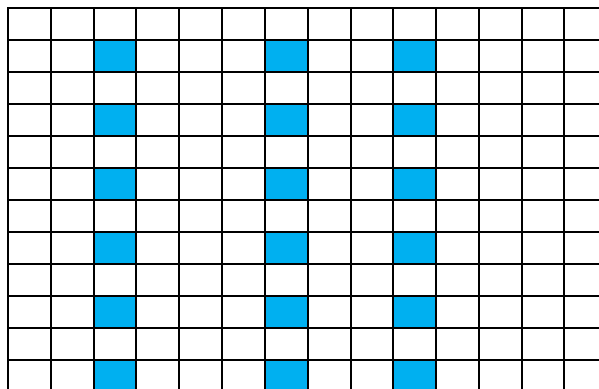
DL-DMRS-add-pos = 2, PDSCH duration = 10, 11, 12:
k = 4n + 2k'; k' = 0, 1
l_0 = 2, l_1 = 6, l_2 = 9

**Table 7.1.2.2.4.1-4: Number of REs allocated for PDSCH per PRB:
PDSCH mapping type A, DMRS configuration type 1, DL-DMRS-max-len=1, Xoh-PDSCH=0, no rate matching**

PDSCH duration	Number of REs used for DMRS				Number of REs used for PDSCH			
	add-pos =0	add-pos =1	add-pos =2	add-pos =3	add-pos =0	add-pos =1	add-pos =2	add-pos =3
14	6	12	18	24	162	156	150	144
13	6	12	18	24	148	142	136	130
12	6	12	18	24	134	128	122	116
Editor's note: Further rows to be added when needed								

Editor's note: Further tables to be added when needed

7.1.2.2.4.2   Determination of TBS and corresponding I_{MCS} and L_{RBs} in automatic mode

In automatic mode, for each PDSCH transmission, the SS shall autonomously select a TBS and an L_{RBs} / I_{MCS} pair for this TBS.

For a given PDSCH transmission, the SS shall first select an initial TBS fulfilling the following conditions:

-   First maximize the transmission of data available in its DL buffer,

-   Then minimize the amount of padding.

Using the selected TBS, the SS shall apply the following rules:

1) When the TBS can be achieved with more than one L_{RBs} / I_{MCS} pairs the SS shall choose the L_{RBs} / I_{MCS} pair with minimum L_{RBs} ($L_{RBs,min}$) i.e. with maximum values of Q_m and R taking into account limitations of Q_m e.g. for the scheduling of system information as according to TS 38.214 [22] clause 5.1.3.1.

2) When there is more than one pair with the same (minimum) L_{RBs} but different I_{MCS}, the smaller I_{MCS} value shall be chosen (what in fact results in smaller Q_m).

3) If L_{RBs} for the TBS is greater than $L_{RBs,max}$ the SS shall try the next greater TBS and use it if $L_{RBs} \leq L_{RBs,max}$ for this TBS. If the SS cannot find a TBS with $L_{RBs} \leq L_{RBs,max}$, the SS shall raise an error.

4) If there is no L_{RBs} / I_{MCS} pair for the TBS the SS shall try the next greater TBS and shall raise an error if it cannot find any.

Annex B.1 provides tables for determination of I_{MCS} and L_{RBs} for different parameters and scenarios.

7.1.2.3   Uplink grant

7.1.2.3.1   General principles and grant allocation types

Uplink grants assignments for NR follow similar principles as for LTE (TS 36.523-3 [12] clause 7.2).

7.1.2.3.1.1   PUCCH synchronisation in connected mode

To prevent the UE from doing RACH procedure for purpose of PUCCH synchronisation the SS gets configured to maintain PUCCH synchronisation at UE by periodically sending a MAC PDU containing the MAC control element 'Timing Advance Command'. The period as configured by TTCN is set to 80 % of the '*timeAlignmentTimer*' value configured at UE.

As in general the PUCCH synchronisation is not time critical, the SS shall choose the next possible occasion for sending of the Timing Advance Command from expiry of the period onward (i.e. the SS shall not raise an error when sending of the Timing Advance Command is not possible at the calculated end of the period).

7.1.2.3.1.2   Grant allocation types

In general PUCCH synchronisation is configured at the SS for the different grant allocation types when the UE is in connected mode.

7.1.2.3.1.2.1   Grant allocation by RACH procedure

The UE gets assigned an uplink grant by the Random Access Response message being configured at the SS.

7.1.2.3.1.2.2   Grant allocation type 1: Uplink grant triggered by SR

The SS gets configured to automatically assign an uplink grant when requested by the UE with a Scheduling Request (SR). The size of this UL grant is configured by TTCN, i.e. there is no requirement for SS implementation to determine the grant size but the configured value shall be used regardless of how much data the UE wants to send. The SS shall assign the UL grant within less than 10ms after it has received the scheduling requests.

7.1.2.3.1.2.3   Grant allocation type 2: Periodic uplink grant

The SS gets configured to assign uplink grants periodically irrespective of any Scheduling Request sent by the UE. The configuration specifies:

- the uplink grant size

- the periodicity: once, several times, continuous

- the period in number of slots (e.g. every slot, every second slot, etc.)

The first uplink grant transmitted is as specified in the explicit timing information. If timing information is "now" the SS selects the first suitable subframe for UL transmission.

The SS shall not assign any additional uplink grant due to a Scheduling Request sent by the UE.

7.1.2.3.1.2.4   Grant allocation type 3: Single uplink grant

Special case of Grant allocation type 2: Uplink grant is assigned only once.

7.1.2.3.1.2.5   Grant allocation type 4: Periodic uplink grant triggered by SR

Combination of Grant allocation type 1 and 2: Periodic uplink grant according to clause 7.1.2.3.1.2.3 is triggered by a Scheduling Request sent by the UE.

7.1.2.3.2 Determination of explicit uplink grants

7.1.2.3.2.1 Parameters

Similar as for the downlink the UE gets preconfigured with parameters for time and frequency domain and a particular UL transmission is addressed by DCI:

1. Time domain resource allocation pre-configured at the UE via RRC signalling:
   Similar parameters are defined for UL as for DL (see clause 7.1.2.2.1.1, TS 38.214 [22] clause 6.1.2.1).

2. Frequency domain resource allocation configured at the UE via RRC signalling:
   Similar as for the DL there is resource allocation type 0 and 1 for the UL (see clause 7.1.2.2.1.2, TS 38.214 [22] clause 6.1.2.2).
   Uplink resource allocation type 1 is assumed to be used for signalling conformance testing.

3. DCI parameters:
   Similar parameters are defined for UL as for DL (see clause 7.1.2.2.1.3, TS 38.212 [20] clauses 7.3.1.1.1 and 7.3.1.1.2, TS 38.214 [22] clause 6.1).

In detail for a particular uplink grant the parameters listed in tables 7.1.2.3.2.1-1 and 7.1.2.3.2.1-2 need to be considered.

Table 7.1.2.3.2.1-1: Parameters affecting TBS determination

Parameter	Comment/Description	Reference
Number of RBs in frequency domain	Indicated by DCI	
Number of symbols in time domain	Pre-configured at UE, selected by DCI; corresponds to "Duration in symbols" TS 38.211 [19] clause 6.4.1.1.3	
MCS index I_{MCS}	Indicated by DCI: Modulation Order Q_m, Target code Rate R	TS 38.214 [22] clause 6.1.4.1; TS 38.214 [22] Table 5.1.3.1-1, 5.1.3.1-2, 6.1.4.1-1
Number of layers υ	In general υ = 1 for signalling conformance tests	
L1 parameters MCS-Table-PDSCH, MCS-Table-PUSCH-transform-precoding, PUSCH-tp	Pre-configured at the UE via RRC signalling: PUSCH-Config.mcs-Table := {qam64, qam256}; PUSCH-Config.mcs-TableTransformPrecoder := {qam64, qam256}; PUSCH-Config.transformPrecoder := {enabled, disabled}; indicates which MCS table to be applied	TS 38.214 [22] clause 6.1.4.1
Support of pi/2 BPSK modulation	In case of transform precoding being enabled and MCS-Table-PUSCH-transform-precoding = qam64 the first two entries of TS 38.214 [22] Table 6.1.4.1-1 depend on whether or not the UE supports pi/2 BPSK modulation.	TS 38.214 [22] clause 6.1.4.1
Number of REs per PRB	Number of REs per PRB which are applicable for the PUSCH transmission	Table 7.1.2.3.2.1-2

Table 7.1.2.3.2.1-2: Parameters affecting number of REs allocated for PUSCH per PRB

Parameter	Comment/Description	Reference
PUSCH mapping type	Type A or B	TS 38.211 [19] clause 6.4.1.1.3
L1 parameter UL-DMRS-config-type	DMRS Configuration type 0 or 1 as indicated to the UE by DMRS-UplinkConfig.dmrs-Type	TS 38.211 [19] clause 6.4.1.1.3
L1 parameter UL-DMRS-add-pos	Number of additional DMRS positions as indicated to the UE by DMRS-UplinkConfig.dmrs-AdditionalPosition: 0, 1, 2 or 3 additional positions	TS 38.211 [19] clause 6.4.1.1.3and tables 6.4.1.1.3-3/4
L1 parameter UL-DMRS-max-len	Number of OFDM symbols used for DMRS as indicated to the UE by DMRS-UplinkConfig.maxLength: Single or double symbol DM-RS	TS 38.211 [19] clause 6.4.1.1.3 and table 6.4.1.1.3-5
L1 parameter Xoh-PUSCH	Number of REs used for additional overhead as indicated to the UE by PUSCH-ServingCellConfig.xOverhead: 0, 6, 12, 18 REs	TS 38.214 [22] clause 6.1.4.2
PUSCH duration	Number of symbols allocated for the PUSCH transmission by DCI	

The number of REs for DMRS and PDSCH per PRB is determined in the same way for UL as for DL (TS 38.211 [19] clause 7.4.1.1.2) $\Rightarrow$ The same values are applicable for UL and DL (see Table 7.1.2.2.4.1-4).

7.1.2.3.2.2   Determination of I_{MCS} and L_{RBs} for given TBS

Uplink grant assignments are fully controlled by TTCN. Annex B.2 provides tables as guideline for choosing values of I_{MCS} and L_{RBs} for a given TBS.

7.1.3   System information

TTCN provides the MIB message to the SS as a structured ASN.1 type using a control ASP (NR_SYSTEM_CTRL_REQ). The SS shall:

- set the *systemFrameNumber* in the MIB to the 6 MSBs of the current SFN. A dummy value is provided by TTCN. The SS shall convey the 4 LSBs of the current SFN in the PBCH transport block. The SS shall fulfil current SFN mod 80 = 0.

- encode the MIB ASN.1 message as specified in Table 8.1-1.

- transmit the encoded MIB message periodically as specified in TS 38.331 [16]. For each transmission, the SS shall update *systemFrameNumber* value as specified above.

7.1.4   Cell(s) handling

7.1.4.1   Multi-cells environment

In the present version of the document, simultaneous configuration and handling of a maximum of 1 E-UTRA cell and 1 NR cell is supported.

7.1.5   Timing aspects

7.1.5.1   SS time

The SS shall provide one system time common across all RATs and cells being configured in a test case. The timing of each configured cell is specified as an offset to this common system time.

7.1.5.2   Cell(s) timing

The timing of E-UTRA cells is specified in TS 36.523-3 [12] subclause 7.4.3.1.

The DL timing of each NR cell is specified in Table 7.1.5.2-1.

Table 7.1.5.2-1: DL timing parameters of simulated NR cells

NR cell Id	H-SFN-offset (note1)	SFN-offset (note2)	Tcell (note3)	Tc-offset (note4)
NR Cell 1	0	0	0	0
NOTE1:	H-SFN-offset corresponds to the offset applied on H-SFN as defined for E-UTRA. It shall be set to 0 for an NR cell.			
NOTE2:	SFN-offset corresponds to the offset applied on system frame number (0 .. 1023).			
NOTE3:	Tcell corresponds to the timing offset in T_s. $T_s = 1/(15000 * 2048)$ as for E-UTRA.			
NOTE4:	Tc-offset corresponds to the timing offset in T_c. $\kappa = T_s/T_c = 64$ with $T_c = 1/(480000 * 4096)$. See TS 38.211 [19] subclause 4.1 and TS 36.211 [23] subclause 4).			

The UL timing of each NR cell is configured as an offset (timing advance) to its DL timing. By default, the timing advance is initialised to 0 (unless specifically specified otherwise in the test case prose).

7.2 EN-DC

7.2.1 Introduction

Subclause 7.2 specifies test methods and design considerations that are specific to EN-DC.

7.2.2 Physical layer aspects

7.2.2.1 Search spaces and DCI

For EN-DC test cases, TTCN provides the DCI configuration only for the following PDCCH search spaces on the active DL BWP:

- Type1-PDCCH common search space: used for the Random Access procedure on the NR cell, and

- UE specific search space (UL and DL): used for data exchange in RRC_CONNECTED state on the NR cell.

    - For the default NR cell operation, TTCN configures DCI formats 0_0 and 1_0 in the SS.

7.2.3 System information

For EN-DC only MIB is configured and broadcast. SIB1 (RMSI) and Other SI are not configured.

8 Other SS requirements with TTCN-3 impact

8.1 Codec requirements

The SS shall comply to the requirements specified in TS 36.523-3 [12] subclause 8.1. In addition, the SS shall also comply to the codec requirements specified in Table 8.1-1.

Table 8.1-1: Codec requirements

Type definitions	Codec requirements	Encoding rule in TTCN-3
NR ASN.1 types used for RRC signalling	shall comply to TS 38.331 [16] subclause 8.3	UNALIGNED_PER_OctetAligned

8.2 External function definitions

The SS shall implement the external functions specified in TS 36.523-3 [12] subclause 8.2.

9 IXIT proforma

9.1 Introduction

The partial IXIT proforma contained in the present document is provided for completion, when the related Abstract Test Suite(s) is(are) to be used against the Implementation Under Test (IUT).

The completed partial IXIT will normally be used in conjunction with the completed ICS, as it adds precision to the information provided by the ICS.

9.2 E-UTRA and EPC PIXIT

The PIXITs specified in TS 36.523-3 [12] subclause 9.1 apply. Additional PIXITs are also specified in Table 9.2-1.

Table 9.2-1: EUTRA_NR PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_ENDC_BandCombination	ENDC_BandCombination_Type	DC_1A_n28A		Band combination for EN-DC test case

9.3 NR and 5GC PIXIT

Table 9.3-1: NR PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_NR_CipheringAlgorithm	CipheringAlgorithm	nea2		Ciphering Algorithm (see Note 1)
px_NR_IntegrityProtAlgorithm	IntegrityProtAlgorithm	nia2		Integrity Algorithm (see Note 1)
NOTE 1: Unless specified otherwise in the test case prose, the null algorithm shall not be used for verification.				

10 Postambles

10.1 Introduction

The purpose of the present clause 10 is to specify the postambles used to bring the UE to a well-defined state regardless of the UE state at the termination of main test body or of the SS conditions and values of the system information inherited from the test.

10.2 EN-DC

The postambles specified in TS 36.523-3 [12] subclause 10.3 are also applicable to EN-DC test cases.

Annex A (normative):
Test Suites

This annex references the approved Test Suites, which accompany the present document. The Test Suites have been produced using the Testing and Test Control Notation version 3 (TTCN-3) according to ES 201 873 [4].

A.1   Baseline of specifications

Table A.1-1 lists the core specifications and test specifications, which the delivered Test Suites are based upon.

Table A.1-1: References of the test and Core specifications

Type	Specification	Release	Version
Core specifications	TS 38.321 [13]	Note 1	Note 2
	TS 38.322 [14]	Note 1	Note 2
	TS 38.323 [15]	Note 1	Note 2
	TS 36.331 [17]	Note 1	Note 2
	TS 38.331 [16]	Note 1	Note 2
	TS 24.301 [18]	Note 1	Note 2
Test specifications	TS 36.508 [10]	Note 1	Note 2
	TS 36.509 [11]	Note 1	Note 2
	TS 38.508-1 [5]	Note 1	Note 2
	TS 38.508-2 [6]	Note 1	Note 2
	TS 38.509 [7]	Note 1	Note 2
	TS 38.523-1 [8]	Note 1	Note 2
	TS 38.523-2 [9]	Note 1	Note 2
NOTE 1: Latest release available, up to the release number of the present document. NOTE 2: Latest version available, up to the version number of the present document.			

A.2   5GS Test Suites

There is no approved Test Suite in the present version of the present document.

Annex B:
NR TBS tables

B.1 TBS table - Downlink (normative)

NOTE: The tables in this clause are limited to the maximum of 25 RBs.

B.1.1 Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22])

B.1.1.1 Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]), DL-DMRS-add-pos = 0

**Table B.1.1.1-1: Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
DL-DMRS-add-pos = 0, PDSCH duration = 14**

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	888	1	27	3776	16	11	9224	11	26
48	1	1	928	1	28	3824	6	22	9480	11	27
56	1	2	984	2	19	3840	11	14	9736	18	20
72	1	3	1032	6	7	3904	5	25	9992	11	28
96	1	4	1064	3	14	3968	9	18	10248	12	27
112	1	5	1128	2	20	4032	13	13	10504	18	21
120	2	2	1160	6	8	4096	5	26	10760	12	28
136	1	6	1192	2	21	4224	8	20	11016	14	25
144	3	1	1224	20	2	4352	5	27	11272	13	27
152	2	3	1256	3	16	4480	5	28	11528	14	26
160	1	7	1288	2	22	4608	6	25	11784	13	28
176	3	2	1320	3	18	4736	7	23	12040	14	27
184	1	8	1352	7	8	4864	9	20	12296	15	26
192	2	4	1416	2	23	4992	6	26	12552	14	28
208	1	9	1480	2	24	5120	6	27	12808	22	21
224	6	0	1544	5	13	5248	9	21	13064	15	27
240	1	11	1608	2	25	5376	6	28	13320	16	26
256	5	1	1672	2	26	5504	18	13	13576	15	28
272	1	12	1736	2	27	5632	9	22	13832	16	27
288	2	6	1800	2	28	5760	7	26	14088	17	26
304	1	13	1864	6	13	5888	8	24	14344	16	28
320	4	3	1928	3	22	6016	7	27	14600	17	27
336	2	7	2024	4	19	6144	9	23	14856	18	26
352	1	14	2088	3	23	6272	7	28	15112	22	23
368	6	2	2152	4	20	6400	11	21	15368	17	28
384	1	15	2216	3	24	6528	9	24	15624	18	27
408	1	17	2280	12	8	6656	8	26	15880	25	22
432	1	16	2408	3	25	6784	10	23	16136	18	28
456	1	18	2472	3	26	6912	8	27	16392	19	27
480	2	11	2536	4	22	7040	9	25	16896	19	28
504	1	19	2600	3	27	7168	8	28	17424	20	27
528	14	0	2664	6	18	7296	10	24	17928	20	28
552	1	20	2728	3	28	7424	9	26	18432	22	26
576	3	8	2792	8	14	7552	12	22	18960	21	28
608	1	21	2856	12	11	7680	22	14	19464	25	25
640	1	22	2976	4	24	7808	9	27	19968	22	28
672	4	7	3104	4	25	7936	18	18	20496	23	28
704	1	23	3240	5	22	8064	9	28	21504	24	28
736	1	24	3368	4	26	8192	10	26	22536	25	28
768	4	8	3496	4	27	8456	11	25			
808	1	25	3624	4	28	8712	10	27			
848	1	26	3752	5	24	8968	10	28			

**Table B.1.1.1-2: Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
DL-DMRS-add-pos = 0, PDSCH duration = 13**

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	808	1	27	3496	6	22	8456	12	25
40	1	1	848	1	28	3624	5	25	8712	11	27
48	1	2	888	4	11	3752	6	23	8968	11	28
64	2	0	928	2	19	3776	22	8	9224	13	25
72	1	3	984	2	20	3824	5	26	9480	12	27
88	1	4	1032	4	12	3840	12	14	9736	12	28
104	1	5	1064	2	21	3904	5	27	9992	14	25
128	1	6	1128	4	13	3968	6	24	10248	13	27
136	3	1	1160	2	22	4032	7	22	10504	14	26
144	2	3	1192	6	9	4096	5	28	10760	13	28
152	1	7	1224	3	18	4224	6	25	11016	14	27
160	3	2	1256	2	23	4352	7	23	11272	15	26
168	1	8	1288	4	14	4480	6	26	11528	14	28
176	2	4	1320	6	11	4608	7	24	11784	15	27
192	1	9	1352	2	24	4736	6	27	12040	16	26
208	6	0	1416	5	13	4864	6	28	12296	15	28
224	1	11	1480	2	25	4992	7	25	12552	16	27
240	7	0	1544	2	26	5120	9	22	12808	17	26
256	1	12	1608	2	27	5248	7	26	13064	16	28
272	3	4	1672	2	28	5376	8	24	13320	17	27
288	1	13	1736	3	22	5504	7	27	13576	18	26
304	2	7	1800	4	19	5632	8	25	13832	17	28
320	1	14	1864	3	23	5760	7	28	14088	18	27
336	3	5	1928	5	16	5888	11	21	14344	19	26
352	1	15	2024	3	24	6016	8	26	14600	22	24
368	5	3	2088	12	8	6272	8	27	14856	18	28
384	1	16	2152	3	25	6400	9	25	15112	20	26
408	1	18	2216	7	14	6528	8	28	15368	23	24
432	2	11	2280	3	26	6656	10	24	15624	19	28
456	1	19	2408	3	27	6784	9	26	15880	20	27
480	14	0	2472	3	28	6912	12	22	16136	24	24
504	1	20	2536	8	14	7040	9	27	16392	20	28
528	1	21	2600	12	11	7168	10	25	16896	24	25
552	5	5	2664	4	24	7296	11	24	17424	21	28
576	1	22	2728	6	19	7424	9	28	17928	22	28
608	3	9	2792	11	12	7552	10	26	18960	23	28
640	1	23	2856	4	25	7680	19	18	19464	24	28
672	1	24	2976	5	22	7808	10	27	20496	25	28
704	4	8	3104	4	26	7936	15	21			
736	1	25	3240	4	27	8064	12	24			
768	1	26	3368	4	28	8192	10	28			

Table B.1.1.1-3: Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
DL-DMRS-add-pos = 0, PDSCH duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	672	10	3	2856	4	27	7552	11	26
40	1	1	704	1	26	2976	4	28	7680	12	25
48	1	2	736	1	27	3104	5	24	7808	11	27
56	2	0	768	1	28	3240	5	25	7936	14	23
64	1	3	808	2	19	3368	6	23	8064	20	19
80	1	4	848	6	7	3496	5	26	8192	11	28
88	3	0	888	2	20	3624	5	27	8456	12	27
96	1	5	928	4	12	3752	5	28	8712	18	21
112	1	6	984	2	21	3824	11	16	8968	12	28
120	3	1	1032	3	16	3840	6	25	9224	13	27
128	2	3	1064	2	22	3904	7	23	9480	14	26
136	1	7	1128	2	23	3968	9	20	9736	13	28
144	3	2	1160	4	14	4032	10	19	9992	14	27
152	1	8	1192	6	11	4096	6	26	10248	15	26
160	2	4	1224	2	24	4224	6	27	10504	14	28
176	1	9	1256	7	9	4352	9	21	10760	15	27
184	6	0	1288	2	25	4480	6	28	11016	16	26
192	1	11	1320	20	3	4608	16	14	11272	15	28
208	4	2	1352	3	20	4736	7	26	11528	16	27
224	1	12	1416	2	26	4864	8	24	11784	16	28
240	2	6	1480	2	27	4992	7	27	12040	17	27
256	1	13	1544	2	28	5120	8	25	12296	18	26
272	2	7	1608	3	22	5248	7	28	12552	17	28
288	1	14	1672	4	19	5376	9	24	12808	18	27
304	3	5	1736	3	23	5504	8	26	13064	19	26
320	1	15	1800	4	20	5632	8	27	13320	18	28
336	1	17	1864	3	24	5760	9	25	13576	19	27
352	1	16	1928	4	21	5888	8	28	13832	23	24
368	1	18	2024	3	25	6016	10	24	14088	19	28
384	12	0	2088	3	26	6144	9	26	14344	20	27
408	1	19	2152	3	27	6272	12	22	14600	24	24
432	14	0	2216	3	28	6400	9	27	14856	20	28
456	1	20	2280	4	23	6528	16	19	15112	21	27
480	1	21	2408	4	24	6656	9	28	15368	24	25
504	5	5	2472	6	19	6784	10	26	15624	21	28
528	1	22	2536	11	12	6912	17	19	16136	25	25
552	4	7	2600	4	25	7040	11	25	16392	22	28
576	1	23	2664	6	20	7168	10	27	16896	23	28
608	1	24	2728	4	26	7296	12	24	17928	24	28
640	1	25	2792	8	16	7424	10	28	18432	25	28

B.1.1.2 Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]), DL-DMRS-add-pos = 1

**Table B.1.1.2-1: Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
DL-DMRS-add-pos = 1, PDSCH duration = 14**

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	848	1	27	3496	4	28	8192	10	27
40	1	1	888	1	28	3624	5	24	8456	12	24
56	1	2	928	4	11	3752	5	25	8712	10	28
72	1	3	984	2	19	3824	8	19	8968	12	25
88	1	4	1032	2	20	3840	9	18	9224	11	27
104	3	0	1064	4	12	3904	6	23	9480	11	28
112	1	5	1128	2	21	3968	5	26	9736	13	25
136	1	6	1160	5	11	4032	12	14	9992	12	27
144	4	0	1192	4	13	4096	5	27	10248	13	26
152	2	3	1224	2	22	4224	6	24	10504	12	28
160	1	7	1256	6	9	4352	5	28	10760	13	27
176	1	8	1288	3	18	4480	6	25	11016	18	22
184	2	4	1320	2	23	4608	7	23	11272	13	28
208	1	9	1352	4	14	4736	6	26	11528	14	27
224	1	11	1416	2	24	4864	7	24	11784	18	23
240	4	2	1480	7	9	4992	6	27	12040	14	28
256	7	0	1544	2	25	5120	6	28	12296	22	21
272	1	12	1608	2	26	5248	7	25	12552	15	27
288	3	4	1672	2	27	5376	16	14	12808	16	26
304	1	13	1736	2	28	5504	7	26	13064	15	28
320	2	7	1800	6	13	5632	8	24	13320	16	27
336	1	14	1864	3	22	5760	7	27	13576	17	26
352	3	5	1928	4	19	5888	9	23	13832	16	28
368	1	15	2024	3	23	6016	7	28	14088	17	27
384	5	3	2088	4	20	6144	11	21	14344	18	26
408	1	16	2152	3	24	6272	9	24	14600	17	28
432	1	18	2216	12	8	6400	8	26	14856	18	27
456	2	11	2280	3	25	6528	10	23	15112	19	26
480	1	19	2408	3	26	6656	8	27	15624	18	28
504	14	0	2472	3	27	6784	9	25	15880	19	27
528	1	20	2536	6	18	6912	8	28	16136	23	24
552	3	8	2600	3	28	7040	10	24	16392	19	28
576	1	21	2664	4	23	7168	9	26	16896	21	26
608	1	22	2728	8	14	7296	12	22	17424	20	28
640	3	9	2792	5	21	7424	9	27	17928	21	28
672	1	23	2856	4	24	7552	10	25	18432	22	27
704	1	24	2976	4	25	7680	11	24	18960	22	28
736	4	8	3104	5	22	7808	9	28	19968	23	28
768	1	25	3240	4	26	7936	10	26	21000	24	28
808	1	26	3368	4	27	8064	17	19	21504	25	28

Table B.1.1.2-2: Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
DL-DMRS-add-pos = 1, PDSCH duration = 13

TBS	L$_{RBs}$	I$_{MCS}$	TBS	L$_{RBs}$	I$_{MCS}$	TBS	L$_{RBs}$	I$_{MCS}$	TBS	L$_{RBs}$	I$_{MCS}$
32	1	0	808	1	28	3368	6	22	8456	13	24
40	1	1	848	4	11	3496	5	25	8712	11	28
48	1	2	888	2	19	3624	5	26	8968	12	27
64	1	3	928	3	14	3752	8	20	9224	18	21
80	1	4	984	2	20	3824	5	27	9480	12	28
96	3	0	1032	2	21	3840	6	24	9736	13	27
104	1	5	1064	5	11	3904	5	28	9992	18	22
120	1	6	1128	2	22	3968	11	16	10248	13	28
128	3	1	1160	3	18	4032	15	13	10504	14	27
136	2	3	1192	2	23	4096	6	25	10760	15	26
144	1	7	1224	4	14	4224	7	23	11016	14	28
160	1	8	1256	6	11	4352	6	26	11272	15	27
168	2	4	1288	2	24	4480	6	27	11528	16	26
184	1	9	1320	7	9	4608	9	21	11784	15	28
192	6	0	1352	5	13	4736	6	28	12040	16	27
208	1	11	1416	2	25	4864	16	14	12296	17	26
224	5	1	1480	2	26	4992	9	22	12552	16	28
240	1	12	1544	2	27	5120	7	26	12808	17	27
256	2	6	1608	2	28	5248	7	27	13064	18	26
272	1	13	1672	3	22	5376	9	23	13320	17	28
288	2	7	1736	4	19	5504	7	28	13576	18	27
304	1	14	1800	3	23	5632	11	21	13832	19	26
320	3	5	1864	5	16	5760	8	26	14088	18	28
336	1	15	1928	3	24	6016	8	27	14344	19	27
352	5	3	2024	5	18	6144	9	25	14600	20	26
368	1	16	2088	3	25	6272	8	28	14856	19	28
384	1	18	2152	5	19	6400	10	24	15112	20	27
408	12	0	2216	3	26	6528	9	26	15368	24	24
432	1	19	2280	3	27	6656	12	22	15624	23	25
480	1	20	2408	3	28	6784	9	27	15880	20	28
504	3	8	2472	8	14	6912	16	19	16136	25	24
528	1	21	2536	7	16	7040	9	28	16392	21	28
552	1	22	2600	4	24	7168	12	23	16896	23	26
576	3	9	2664	11	12	7296	10	26	17424	22	28
608	1	23	2728	4	25	7552	10	27	17928	23	28
640	1	24	2792	5	22	7680	12	24	18960	24	28
672	4	8	2856	6	20	7808	10	28	19464	25	28
704	1	25	2976	4	26	7936	11	26			
736	1	26	3104	4	27	8064	21	18			
768	1	27	3240	4	28	8192	11	27			

Table B.1.1.2-3: Downlink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
DL-DMRS-add-pos = 1, PDSCH duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	704	1	27	2856	4	28	7296	19	19
32	1	1	736	3	13	2976	5	24	7424	11	27
48	1	2	768	2	19	3104	5	25	7552	13	24
56	1	3	808	6	7	3240	6	23	7680	18	20
72	1	4	848	2	20	3368	5	26	7808	11	28
88	1	5	888	4	12	3496	5	27	7936	13	25
96	2	2	928	2	21	3624	5	28	8064	14	24
112	1	6	984	3	16	3752	6	25	8192	12	27
120	2	3	1032	2	22	3776	9	20	8456	12	28
128	1	7	1064	3	18	3824	20	11	8712	14	25
144	1	8	1128	2	23	3840	10	19	8968	13	27
152	2	4	1160	2	24	3904	6	26	9224	13	28
168	1	9	1192	7	9	3968	8	22	9480	14	27
176	6	0	1224	5	13	4032	7	24	9736	15	26
184	1	11	1256	2	25	4096	6	27	9992	14	28
192	4	2	1288	3	20	4224	6	28	10248	15	27
208	7	0	1320	2	26	4352	7	25	10504	16	26
224	1	12	1352	8	9	4480	9	22	10760	15	28
240	1	13	1416	2	27	4608	7	26	11016	16	27
256	2	7	1480	6	13	4736	7	27	11272	16	28
272	1	14	1544	3	22	4864	8	25	11528	17	27
288	3	5	1608	12	7	4992	7	28	11784	18	26
304	1	15	1672	3	23	5120	11	21	12040	17	28
320	5	3	1736	3	24	5248	8	26	12296	18	27
336	1	16	1800	5	18	5376	8	27	12552	19	26
352	1	18	1864	3	25	5504	9	25	12808	18	28
368	12	0	1928	7	14	5632	8	28	13064	19	27
384	1	19	2024	3	26	5760	10	24	13320	23	24
408	3	7	2088	3	27	5888	9	26	13576	19	28
432	1	20	2152	3	28	6016	12	22	13832	21	26
456	1	21	2216	8	14	6144	9	27	14088	20	28
480	5	5	2280	7	16	6272	18	18	14344	21	27
504	1	22	2408	4	24	6400	9	28	14856	21	28
528	4	7	2472	4	25	6528	10	26	15112	22	27
552	1	23	2536	5	22	6656	19	18	15368	25	25
576	1	24	2600	4	26	6784	10	27	15624	22	28
608	4	8	2664	8	16	6912	12	24	16392	23	28
640	1	25	2728	4	27	7040	10	28	16896	24	28
672	1	26	2792	6	21	7168	11	26	17928	25	28

B.1.2 Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22])

B.1.2.1 Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), DL-DMRS-add-pos = 0

Table B.1.2.1-1: Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), DL-DMRS-add-pos = 0, PDSCH duration = 14

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	1224	20	1	4480	4	25	11784	11	24
56	1	1	1256	3	10	4608	4	26	12040	10	27
72	2	0	1288	2	15	4736	4	27	12296	11	25
96	1	2	1320	3	11	4864	9	13	12552	14	21
112	3	0	1352	7	4	4992	5	23	12808	11	26
120	2	1	1416	2	16	5120	6	20	13064	11	27
136	1	3	1480	2	17	5248	5	24	13320	12	25
144	4	0	1544	5	7	5376	6	21	13576	15	21
176	3	1	1608	2	18	5504	18	7	13832	12	26
184	1	4	1672	2	19	5632	5	25	14088	14	23
192	2	2	1736	2	20	5760	5	26	14344	12	27
224	6	0	1800	2	21	5888	8	17	14600	13	25
240	1	5	1864	6	7	6016	5	27	14856	14	24
272	1	6	1928	2	22	6144	9	16	15112	13	26
288	2	3	2024	2	23	6272	7	21	15368	16	22
304	1	7	2088	3	16	6400	6	24	15624	13	27
336	9	0	2152	2	24	6528	9	17	15880	15	24
352	1	8	2216	3	17	6656	6	25	16136	14	26
368	6	1	2280	2	25	6784	10	16	16392	19	20
384	1	9	2408	2	26	6912	6	26	16896	14	27
432	1	10	2472	3	19	7040	7	23	17424	15	26
456	1	11	2536	4	15	7168	6	27	17928	15	27
480	2	5	2600	3	20	7296	10	17	18432	16	26
504	1	12	2664	6	11	7424	7	24	18960	16	27
528	14	0	2728	3	21	7552	8	22	19464	17	26
552	1	13	2792	8	8	7680	22	8	19968	18	25
576	3	4	2856	3	22	7808	7	25	20496	17	27
608	1	14	2976	4	17	7936	18	11	21000	18	26
640	1	15	3104	3	23	8064	7	26	21504	18	27
672	11	1	3240	3	24	8192	10	19	22032	19	26
704	1	16	3368	3	25	8456	7	27	22536	19	27
736	1	17	3496	3	26	8712	10	20	23040	20	26
768	4	4	3624	3	27	8968	8	25	23568	21	25
808	1	18	3752	5	17	9224	8	26	24072	20	27
848	1	19	3776	16	5	9480	8	27	24576	21	26
888	1	20	3824	4	22	9736	18	13	25104	21	27
928	1	21	3840	11	8	9992	9	25	25608	22	26
984	1	22	3904	5	18	10248	12	20	26632	22	27
1032	1	23	3968	9	11	10504	9	26	27656	23	27
1064	1	24	4032	4	23	10760	9	27	28168	25	25
1128	1	25	4096	5	19	11016	11	23	28680	24	27
1160	1	26	4224	4	24	11272	10	25	29192	25	26
1192	1	27	4352	5	20	11528	10	26	30216	25	27

Table B.1.2.1-2: Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]),
DL-DMRS-add-pos = 0, PDSCH duration = 13

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	1192	9	3	4352	4	27	11528	11	26
48	1	1	1224	3	11	4480	6	19	11784	15	20
64	2	0	1256	2	16	4608	5	23	12040	11	27
88	1	2	1288	4	8	4736	6	20	12296	12	25
104	2	1	1320	6	5	4864	5	24	12552	13	24
128	1	3	1352	2	17	4992	7	18	12808	12	26
136	4	0	1416	5	7	5120	5	25	13064	12	27
160	3	1	1480	2	18	5248	5	26	13320	13	25
168	1	4	1544	2	19	5376	8	17	13576	14	24
176	2	2	1608	2	20	5504	5	27	13832	13	26
208	6	0	1672	2	21	5632	8	18	14088	18	20
224	1	5	1736	2	22	5760	6	24	14344	13	27
240	7	0	1800	4	12	5888	11	14	14600	15	24
256	1	6	1864	2	23	6016	7	22	14856	14	26
272	3	2	1928	5	10	6144	6	25	15112	20	19
288	1	7	2024	2	24	6272	6	26	15368	14	27
320	1	8	2088	2	25	6400	7	23	15624	16	24
336	6	1	2152	2	26	6528	6	27	15880	15	26
352	1	9	2216	2	27	6656	10	17	16136	24	17
384	1	10	2280	3	19	6784	7	24	16392	15	27
408	1	11	2408	3	20	6912	8	22	16896	16	26
432	2	5	2472	3	21	7040	9	20	17424	16	27
456	1	12	2536	8	8	7168	7	25	17928	17	26
480	14	0	2600	3	22	7296	8	23	18432	17	27
504	1	13	2664	4	17	7424	7	26	18960	18	26
528	1	14	2728	6	12	7552	10	19	19464	18	27
552	10	1	2792	3	23	7680	7	27	19968	19	26
576	1	15	2856	4	18	7808	8	24	20496	20	25
608	11	1	2976	3	24	7936	15	14	21000	19	27
640	1	16	3104	3	25	8064	12	17	21504	21	25
672	1	17	3240	3	26	8192	8	25	22032	20	27
704	4	4	3368	3	27	8456	8	26	22536	22	25
736	1	18	3496	4	22	8712	8	27	23040	21	27
768	1	19	3624	5	18	8968	11	21	23568	23	25
808	1	20	3752	4	23	9224	9	25	24072	22	27
848	1	21	3776	22	4	9480	9	26	24576	23	26
888	1	22	3824	5	19	9736	9	27	25104	23	27
928	1	23	3840	4	24	9992	14	18	25608	24	26
984	1	24	3904	5	20	10248	10	25	26120	24	27
1032	1	25	3968	6	17	10504	10	26	26632	25	26
1064	1	26	4032	7	15	10760	11	24	27144	25	27
1128	1	27	4096	4	25	11016	10	27			
1160	2	15	4224	4	26	11272	11	25			

**Table B.1.2.1-3: Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]),
DL-DMRS-add-pos = 0, PDSCH duration = 12**

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	1032	1	27	4032	10	12	10504	11	26
48	1	1	1064	2	15	4096	5	23	10760	13	23
56	2	0	1128	2	16	4224	6	20	11016	11	27
80	1	2	1160	4	8	4352	5	24	11272	15	21
88	3	0	1192	6	5	4480	6	21	11528	12	26
96	2	1	1224	2	17	4608	5	25	11784	12	27
112	1	3	1256	8	4	4736	5	26	12040	13	25
120	4	0	1288	2	18	4864	8	17	12296	14	24
144	3	1	1352	3	13	4992	5	27	12552	13	26
152	1	4	1416	2	19	5120	8	18	12808	13	27
160	2	2	1480	2	20	5248	6	24	13064	14	25
184	6	0	1544	2	21	5376	9	17	13320	14	26
192	1	5	1608	2	22	5504	6	25	13576	19	20
208	4	1	1672	2	23	5632	8	20	13832	14	27
224	1	6	1736	3	16	5760	6	26	14088	16	24
240	2	3	1800	2	24	5888	6	27	14344	15	26
256	1	7	1864	2	25	6016	10	17	14600	24	17
288	1	8	1928	2	26	6144	7	24	14856	15	27
304	6	1	2024	2	27	6272	8	22	15112	18	23
320	1	9	2088	3	19	6400	7	25	15368	16	26
352	1	10	2152	3	20	6528	16	12	15624	17	25
368	1	11	2216	3	21	6656	7	26	15880	16	27
384	12	0	2280	4	16	6784	10	19	16136	25	18
408	1	12	2408	3	22	6912	7	27	16392	17	26
432	14	0	2472	6	12	7040	8	24	16896	17	27
456	1	13	2536	3	23	7168	10	20	17424	18	26
480	1	14	2600	4	18	7296	12	17	17928	18	27
504	10	1	2664	3	24	7424	8	25	18432	19	26
528	1	15	2728	4	19	7552	11	19	18960	19	27
552	11	1	2792	3	25	7680	8	26	19464	21	25
576	1	16	2856	3	26	7808	10	22	19968	20	27
608	1	17	2976	3	27	7936	8	27	20496	22	25
640	1	18	3104	5	17	8064	20	12	21000	21	27
672	13	1	3240	4	22	8192	9	25	21504	23	25
704	1	19	3368	4	23	8456	12	20	22032	22	27
736	1	20	3496	5	19	8712	9	26	23040	23	27
768	1	21	3624	4	24	8968	9	27	23568	24	27
808	1	22	3752	4	25	9224	10	25	24072	25	26
848	1	23	3824	11	10	9480	10	26	24576	25	27
888	1	24	3840	4	26	9736	11	24			
928	1	25	3904	5	22	9992	10	27			
984	1	26	3968	4	27	10248	11	25			

B.1.2.2 Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), DL-DMRS-add-pos = 1

Table B.1.2.2-1: Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), DL-DMRS-add-pos = 1, PDSCH duration = 14

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	1224	2	15	4608	4	27	12040	13	22
56	1	1	1256	21	1	4736	6	19	12296	11	26
72	2	0	1288	3	11	4864	5	23	12552	13	23
88	1	2	1320	2	16	4992	6	20	12808	11	27
104	3	0	1352	4	8	5120	5	24	13064	15	21
112	2	1	1416	2	17	5248	7	18	13320	12	26
136	1	3	1480	8	4	5376	5	25	13576	14	23
144	4	0	1544	2	18	5504	5	26	13832	12	27
176	1	4	1608	2	19	5632	8	17	14088	13	25
184	2	2	1672	2	20	5760	5	27	14344	14	24
224	1	5	1736	2	21	5888	9	16	14600	13	26
240	4	1	1800	6	7	6016	7	21	14856	18	20
256	7	0	1864	2	22	6144	6	24	15112	13	27
272	1	6	1928	4	12	6272	9	17	15368	15	24
288	3	2	2024	2	23	6400	6	25	15624	14	26
304	1	7	2088	2	24	6528	10	16	15880	19	20
336	1	8	2152	2	25	6656	6	26	16136	14	27
352	6	1	2216	2	26	6784	7	23	16392	16	24
368	1	9	2280	3	18	6912	6	27	16896	15	26
408	1	10	2408	2	27	7040	10	17	17424	15	27
432	1	11	2472	3	20	7168	7	24	17928	16	26
456	2	5	2536	6	11	7296	8	22	18432	16	27
480	1	12	2600	3	21	7424	9	20	18960	17	26
504	14	0	2664	4	16	7552	7	25	19464	17	27
528	1	13	2728	8	8	7680	11	17	19968	18	26
552	3	4	2792	3	22	7808	7	26	20496	19	25
576	1	14	2856	4	17	7936	10	19	21000	18	27
608	1	15	2976	3	23	8064	7	27	21504	20	25
640	11	1	3104	3	24	8192	8	24	22032	19	27
672	1	16	3240	3	25	8456	12	17	22536	20	26
704	1	17	3368	3	26	8712	8	25	23040	20	27
736	4	4	3496	3	27	8968	8	26	23568	21	26
768	1	18	3624	5	17	9224	8	27	24072	21	27
808	1	19	3752	4	22	9480	11	21	24576	22	26
848	1	20	3824	8	12	9736	9	25	25608	22	27
888	1	21	3840	4	23	9992	9	26	26120	24	25
928	1	22	3904	6	16	10248	10	24	26632	23	27
984	1	23	3968	5	19	10504	9	27	27144	25	25
1032	1	24	4032	12	8	10760	10	25	27656	24	27
1064	4	6	4096	4	24	11016	12	22	28680	25	27
1128	1	25	4224	6	17	11272	10	26			
1160	1	27	4352	4	25	11528	10	27			
1192	4	7	4480	4	26	11784	11	25			

**Table B.1.2.2-2: Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]),
DL-DMRS-add-pos = 1, PDSCH duration = 13**

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	1192	2	16	4480	6	20	11528	11	27
48	1	1	1224	4	8	4608	5	24	11784	12	25
64	2	0	1256	6	5	4736	6	21	12040	13	24
80	1	2	1288	2	17	4864	5	25	12296	12	26
96	3	0	1352	5	7	4992	6	22	12552	12	27
104	2	1	1416	2	18	5120	5	26	12808	13	25
120	1	3	1480	2	19	5248	5	27	13064	14	24
128	4	0	1544	2	20	5376	9	16	13320	13	26
160	1	4	1608	2	21	5504	7	21	13576	13	27
168	2	2	1672	2	22	5632	6	24	13832	14	25
192	6	0	1736	4	12	5760	8	19	14088	15	24
208	1	5	1800	2	23	5888	6	25	14344	14	26
240	1	6	1864	2	24	6016	6	26	14600	14	27
256	2	3	1928	3	17	6144	7	23	14856	16	24
272	1	7	2024	2	25	6272	6	27	15112	15	26
304	1	8	2088	2	26	6400	10	17	15368	24	17
320	6	1	2152	5	12	6528	7	24	15624	16	25
336	1	9	2216	3	19	6656	8	22	15880	15	27
368	1	10	2280	3	20	6784	9	20	16136	16	26
384	1	11	2408	3	21	6912	7	25	16392	21	21
408	12	0	2472	8	8	7040	7	26	16896	16	27
432	1	12	2536	3	22	7168	12	16	17424	17	26
480	1	13	2600	4	17	7296	7	27	17928	17	27
504	3	4	2664	3	23	7424	8	24	18432	18	26
528	1	14	2728	4	18	7552	9	22	18960	18	27
552	1	15	2792	3	24	7680	12	17	19464	19	26
576	17	0	2856	6	13	7808	8	25	19968	19	27
608	1	16	2976	3	25	7936	9	23	20496	20	26
640	1	17	3104	3	26	8064	8	26	21000	20	27
672	4	4	3240	3	27	8192	11	20	21504	21	26
704	1	18	3368	4	22	8456	8	27	22032	21	27
736	1	19	3496	5	18	8712	9	25	22536	22	26
768	1	20	3624	4	23	8968	12	20	23040	22	27
808	1	21	3752	4	24	9224	9	26	23568	23	26
848	1	22	3824	5	20	9480	9	27	24072	23	27
888	1	23	3840	6	17	9736	10	25	24576	24	26
928	1	24	3904	4	25	9992	12	22	25104	24	27
984	1	25	3968	11	10	10248	10	26	25608	25	26
1032	1	26	4032	4	26	10504	10	27	26120	25	27
1064	1	27	4096	5	22	10760	11	25			
1128	2	15	4224	4	27	11016	14	21			
1160	3	11	4352	5	23	11272	11	26			

Table B.1.2.2-3: Downlink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]),
DL-DMRS-add-pos = 1, PDSCH duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	1032	2	15	3904	6	19	9736	11	25
48	1	1	1064	3	11	3968	5	23	9992	11	26
56	2	0	1128	2	16	4032	7	17	10248	13	23
72	1	2	1160	2	17	4096	6	20	10504	11	27
88	3	0	1224	5	7	4224	5	24	10760	15	21
96	2	1	1256	2	18	4352	5	25	11016	12	26
112	1	3	1288	3	13	4480	6	22	11272	12	27
120	4	0	1320	2	19	4608	5	26	11528	13	25
144	1	4	1352	9	4	4736	5	27	11784	13	26
152	2	2	1416	2	20	4864	8	18	12040	15	23
176	6	0	1480	6	7	4992	6	24	12296	13	27
184	1	5	1544	2	22	5120	11	14	12552	15	24
192	4	1	1608	2	23	5248	6	25	12808	14	26
208	7	0	1672	3	16	5376	8	20	13064	19	20
224	1	6	1736	2	24	5504	6	26	13320	14	27
240	1	7	1800	2	25	5632	6	27	13576	17	23
272	1	8	1864	2	26	5760	10	17	13832	15	26
288	6	1	1928	2	27	5888	7	24	14088	15	27
304	1	9	2024	3	19	6016	8	22	14344	17	24
336	1	10	2088	3	20	6144	7	25	14600	16	26
352	1	11	2152	3	21	6272	18	11	14856	21	21
368	12	0	2216	8	8	6400	7	26	15112	16	27
384	1	12	2280	3	22	6528	10	19	15368	25	18
432	1	13	2408	3	23	6656	7	27	15624	17	26
456	1	14	2472	4	18	6784	9	22	15880	18	25
480	10	1	2536	3	24	6912	12	17	16136	17	27
504	1	15	2600	4	19	7040	8	25	16392	18	26
528	11	1	2664	3	25	7168	9	23	16896	18	27
552	1	16	2728	3	26	7296	8	26	17424	19	26
576	1	17	2792	6	14	7424	11	20	17928	19	27
608	4	4	2856	3	27	7552	8	27	18432	20	26
640	1	18	2976	5	17	7680	18	13	18960	20	27
672	1	19	3104	4	22	7808	11	21	19464	21	26
704	1	20	3240	4	23	7936	9	25	19968	21	27
736	3	7	3368	4	24	8064	14	17	20496	23	25
768	1	22	3496	5	20	8192	9	26	21000	22	27
808	1	23	3624	4	25	8456	9	27	22032	23	27
848	1	24	3752	4	26	8712	10	25	22536	24	27
888	1	25	3776	9	13	8968	12	22	23040	25	26
928	1	26	3824	4	27	9224	10	26	23568	25	27
984	1	27	3840	10	12	9480	10	27			

B.2 Uplink TBS (informative)

NOTE: The tables in this clause are limited to the maximum of 25 RBs.

B.2.1 Uplink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22])

B.2.1.1 Uplink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]), UL-DMRS-add-pos = 0

**Table B.2.1.1-1: Uplink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
UL-DMRS-add-pos = 0, PUSCH duration = 14**

TBS	pairs of {L_{RBs} I_{MCS}}
32	{1 0}
48	{1 1}
56	{1 2}
72	{1 3} {2 0}
96	{1 4} {2 1}
112	{1 5} {3 0}
120	{2 2}
136	{1 6}
144	{3 1} {4 0}
152	{2 3}
160	{1 7}
176	{3 2}
184	{1 8} {5 0}
192	{2 4} {4 1}
208	{1 9} {1 10}
224	{6 0}
240	{1 11} {2 5} {3 3} {4 2}
256	{5 1}
272	{1 12} {7 0}
288	{2 6} {3 4}
304	{1 13} {5 2} {6 1} {8 0}
320	{4 3}
336	{2 7} {9 0}
352	{1 14} {3 5} {7 1}
368	{6 2}
384	{1 15} {2 8} {4 4} {10 0}
408	{1 17} {5 3} {8 1}
432	{1 16} {2 9} {2 10} {3 6} {7 2} {11 0}
456	{1 18} {9 1} {12 0}
480	{2 11} {4 5} {5 4} {6 3}
504	{1 19} {3 7} {8 2} {10 1} {13 0}
528	{14 0}
552	{1 20} {2 12} {7 3} {9 2} {11 1}
576	{3 8} {4 6} {15 0}
608	{1 21} {5 5} {6 4} {10 2} {12 1} {16 0}
640	{1 22} {2 13} {3 9} {3 10} {8 3} {13 1} {17 0}
672	{4 7} {11 2}
704	{1 23} {2 14} {5 6} {7 4} {14 1} {18 0}
736	{1 24} {3 11} {6 5} {9 3} {12 2} {19 0}
768	{4 8} {15 1} {20 0}
808	{1 25} {2 15} {8 4} {10 3} {13 2} {16 1} {21 0}
848	{1 26} {2 16} {2 17} {3 12} {5 7} {6 6} {7 5} {14 2} {17 1} {22 0}
888	{1 27} {2 18} {4 9} {4 10} {9 4} {11 3} {18 1} {23 0}
928	{1 28} {3 13} {15 2} {24 0}
984	{2 19} {4 11} {5 8} {8 5} {10 4} {12 3} {16 2} {19 1} {25 0}
1032	{6 7} {7 6} {13 3} {17 2} {20 1}
1064	{3 14} {11 4} {21 1}
1128	{2 20} {4 12} {5 9} {5 10} {9 5} {14 3} {18 2} {22 1}
1160	{6 8} {7 7} {8 6} {19 2} {23 1}
1192	{2 21} {3 15} {5 11} {10 5} {12 4} {15 3} {24 1}
1224	{20 2}
1256	{3 16} {3 17} {4 13} {25 1}
1288	{2 22} {6 9} {6 10} {9 6} {13 4} {16 3} {21 2}
1320	{3 18} {11 5}
1352	{7 8} {8 7} {17 3} {22 2}
1416	{2 23} {4 14} {5 12} {10 6} {14 4} {23 2}
1480	{2 24} {3 19} {6 11} {12 5} {15 4} {18 3} {24 2}
1544	{5 13} {7 9} {7 10} {8 8} {9 7} {19 3} {25 2}
1608	{2 25} {3 20} {4 15} {11 6} {13 5} {16 4} {20 3}
1672	{2 26} {4 16} {4 17} {6 12} {7 11} {10 7} {14 5} {17 4} {21 3}
1736	{2 27} {8 9} {8 10} {9 8} {12 6}
1800	{2 28} {3 21} {4 18} {5 14} {15 5} {18 4} {22 3}
1864	{6 13} {11 7} {13 6} {19 4} {23 3}
1928	{3 22} {7 12} {8 11} {9 9} {10 8} {16 5} {24 3}

2024	{4 19} {5 15} {9 10} {12 7} {14 6} {20 4} {25 3}
2088	{3 23} {5 16} {5 17} {6 14} {11 8} {17 5} {21 4}
2152	{4 20} {7 13} {9 11} {10 9} {10 10} {13 7} {15 6} {18 5} {22 4}
2216	{3 24} {5 18} {8 12}
2280	{12 8} {16 6} {19 5} {23 4}
2408	{3 25} {4 21} {6 15} {10 11} {11 9} {11 10} {14 7} {17 6} {20 5} {24 4}
2472	{3 26} {5 19} {6 17} {7 14} {8 13} {9 12} {13 8} {25 4}
2536	{4 22} {6 16} {15 7} {18 6} {21 5}
2600	{3 27} {12 9} {12 10}
2664	{6 18} {11 11} {14 8} {16 7} {22 5}
2728	{3 28} {4 23} {5 20} {7 15} {10 12} {19 6}
2792	{8 14} {9 13} {13 9} {13 10} {23 5}
2856	{12 11} {15 8} {17 7} {20 6} {24 5}
2976	{4 24} {5 21} {6 19} {7 16} {7 17} {14 9} {18 7} {21 6} {25 5}
3104	{4 25} {7 18} {8 15} {10 13} {11 12} {13 11} {14 10} {16 8} {22 6}
3240	{5 22} {6 20} {9 14} {15 9} {15 10} {17 8} {19 7}
3368	{4 26} {8 16} {8 17} {12 12} {14 11} {20 7} {23 6}
3496	{4 27} {5 23} {6 21} {7 19} {9 15} {10 14} {11 13} {16 9} {16 10} {18 8} {21 7} {24 6}
3624	{4 28} {8 18} {13 12} {15 11} {19 8} {25 6}
3752	{5 24} {7 20} {9 16} {9 17} {12 13} {17 9} {17 10} {22 7}
3776	{16 11} {23 7}
3824	{6 22} {20 8}
3840	{11 14} {14 12} {18 9} {18 10}
3904	{5 25} {8 19} {10 15}
3968	{9 18} {21 8} {24 7}
4032	{13 13} {17 11} {19 9} {19 10}
4096	{5 26} {6 23} {7 21} {10 16} {10 17} {15 12} {25 7}
4224	{8 20} {11 15} {12 14} {18 11} {20 9} {20 10} {22 8}
4352	{5 27} {6 24} {7 22} {9 19} {10 18} {14 13} {16 12} {23 8}
4480	{5 28} {13 14} {19 11} {21 9} {21 10}
4608	{6 25} {8 21} {11 16} {11 17} {12 15} {15 13} {17 12} {24 8}
4736	{7 23} {20 11} {22 9} {22 10} {25 8}
4864	{9 20} {10 19} {11 18} {14 14} {18 12} {23 9} {23 10}
4992	{6 26} {8 22} {12 16} {12 17} {13 15} {16 13} {21 11}
5120	{6 27} {7 24} {24 9} {24 10}
5248	{9 21} {12 18} {15 14} {17 13} {19 12} {22 11}
5376	{6 28} {7 25} {8 23} {10 20} {11 19} {13 16} {13 17} {14 15} {25 9} {25 10}
5504	{18 13} {20 12} {23 11}
5632	{9 22} {16 14}
5760	{7 26} {10 21} {13 18} {14 16} {14 17} {15 15} {21 12} {24 11}
5888	{8 24} {11 20} {12 19} {17 14} {19 13}
6016	{7 27} {22 12} {25 11}
6144	{9 23} {14 18} {20 13}
6272	{7 28} {8 25} {10 22} {15 16} {15 17} {16 15} {18 14} {23 12}
6400	{11 21} {12 20} {13 19}
6528	{9 24} {21 13} {24 12}
6656	{8 26} {15 18} {16 16} {16 17} {17 15} {19 14}
6784	{10 23} {14 19} {22 13} {25 12}
6912	{8 27} {11 22} {13 20} {20 14}
7040	{9 25} {12 21} {16 18} {17 16} {17 17} {18 15}
7168	{8 28} {23 13}
7296	{10 24} {15 19} {21 14}
7424	{9 26} {11 23} {18 16} {18 17} {19 15} {24 13}
7552	{12 22} {13 21} {14 20} {17 18}
7680	{22 14} {25 13}
7808	{9 27} {10 25} {16 19} {20 15}
7936	{18 18} {19 16} {19 17}
8064	{9 28} {11 24} {15 20} {23 14}
8192	{10 26} {12 23} {13 22} {14 21} {17 19} {20 16} {20 17} {21 15}
8456	{11 25} {19 18} {22 15} {24 14}
8712	{10 27} {12 24} {14 22} {15 21} {16 20} {18 19} {20 18} {21 16} {21 17} {25 14}
8968	{10 28} {13 23} {23 15}
9224	{11 26} {12 25} {16 21} {17 20} {19 19} {21 18} {22 16} {22 17} {24 15}
9480	{11 27} {13 24} {14 23} {15 22} {23 16} {23 17}
9736	{18 20} {20 19} {22 18} {25 15}

9992	{11 28} {12 26} {16 22} {17 21} {24 16} {24 17}
10248	{12 27} {13 25} {14 24} {15 23} {19 20} {21 19} {23 18}
10504	{18 21} {24 18} {25 16} {25 17}
10760	{12 28} {13 26} {17 22} {20 20} {22 19}
11016	{14 25} {15 24} {16 23} {19 21} {25 18}
11272	{13 27} {18 22} {21 20} {23 19}
11528	{14 26} {17 23}
11784	{13 28} {15 25} {16 24} {20 21} {22 20} {24 19}
12040	{14 27} {19 22}
12296	{15 26} {18 23} {21 21} {23 20} {25 19}
12552	{14 28} {16 25} {17 24} {20 22}
12808	{22 21} {24 20}
13064	{15 27} {18 24} {19 23}
13320	{16 26} {17 25} {21 22} {23 21} {25 20}
13576	{15 28} {20 23}
13832	{16 27} {19 24} {22 22}
14088	{17 26} {18 25} {24 21}
14344	{16 28} {21 23}
14600	{17 27} {20 24} {23 22} {25 21}
14856	{18 26} {19 25}
15112	{22 23} {24 22}
15368	{17 28} {21 24}
15624	{18 27} {19 26} {20 25} {23 23}
15880	{25 22}
16136	{18 28} {22 24}
16392	{19 27} {20 26} {21 25} {24 23}
16896	{19 28} {22 25} {23 24} {25 23}
17424	{20 27} {21 26} {24 24}
17928	{20 28} {21 27} {23 25}
18432	{22 26} {25 24}
18960	{21 28} {22 27} {23 26} {24 25}
19464	{25 25}
19968	{22 28} {23 27} {24 26}
20496	{23 28} {24 27} {25 26}
21504	{24 28} {25 27}
22536	{25 28}

B.2.1.2 Uplink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]), UL-DMRS-add-pos = 1

**Table B.2.1.2-1: Uplink TBS using MCS table 5.1.3.1-1 (TS 38.214 [22]),
UL-DMRS-add-pos = 1, PUSCH duration = 14**

TBS	pairs of {L$_{RBs}$ I$_{MCS}$}
32	{1 0}
40	{1 1}
56	{1 2}
72	{1 3} {2 0}
88	{1 4} {2 1}
104	{3 0}
112	{1 5} {2 2}
136	{1 6} {3 1}
144	{4 0}
152	{2 3}
160	{1 7}
176	{1 8} {3 2} {5 0}
184	{2 4} {4 1}
208	{1 9} {1 10}
224	{1 11} {2 5} {3 3} {6 0}
240	{4 2} {5 1}
256	{7 0}
272	{1 12} {2 6}
288	{3 4} {5 2} {6 1} {8 0}
304	{1 13} {4 3}
320	{2 7}
336	{1 14} {7 1} {9 0}
352	{3 5} {6 2}
368	{1 15} {2 8} {4 4} {10 0}
384	{5 3} {8 1}
408	{1 16} {1 17} {2 9} {2 10} {3 6} {7 2} {11 0}
432	{1 18} {9 1} {12 0}
456	{2 11} {4 5} {6 3}
480	{1 19} {3 7} {5 4} {8 2} {10 1} {13 0}
504	{14 0}
528	{1 20} {2 12} {7 3} {9 2} {11 1}
552	{3 8} {4 6} {15 0}
576	{1 21} {5 5} {6 4} {12 1}
608	{1 22} {2 13} {8 3} {10 2} {16 0}
640	{3 9} {3 10} {4 7} {11 2} {13 1} {17 0}
672	{1 23} {2 14} {7 4} {14 1} {18 0}
704	{1 24} {3 11} {5 6} {6 5} {9 3} {12 2} {19 0}
736	{4 8} {15 1} {20 0}
768	{1 25} {2 15} {8 4} {10 3} {13 2} {16 1} {21 0}
808	{1 26} {2 16} {2 17} {3 12} {5 7} {7 5} {17 1} {22 0}
848	{1 27} {2 18} {4 9} {4 10} {6 6} {9 4} {11 3} {14 2} {23 0}
888	{1 28} {3 13} {15 2} {18 1} {24 0}
928	{4 11} {5 8} {8 5} {12 3} {19 1} {25 0}
984	{2 19} {6 7} {7 6} {10 4} {16 2} {20 1}
1032	{2 20} {3 14} {5 9} {5 10} {9 5} {11 4} {13 3} {17 2} {21 1}
1064	{4 12} {14 3} {18 2} {22 1}
1128	{2 21} {3 15} {6 8} {7 7} {8 6} {12 4} {19 2} {23 1}
1160	{5 11} {10 5} {15 3} {24 1}
1192	{4 13} {20 2} {25 1}
1224	{2 22} {3 16} {3 17} {9 6} {13 4} {16 3}
1256	{6 9} {6 10} {21 2}
1288	{3 18} {7 8} {8 7} {11 5} {22 2}
1320	{2 23} {5 12} {14 4} {17 3}
1352	{4 14} {23 2}
1416	{2 24} {3 19} {6 11} {10 6} {12 5} {15 4} {18 3} {24 2}
1480	{7 9} {7 10} {8 8} {9 7} {19 3} {25 2}
1544	{2 25} {4 15} {5 13} {11 6} {13 5} {16 4} {20 3}
1608	{2 26} {3 20} {4 16} {4 17} {6 12} {7 11} {10 7} {17 4} {21 3}
1672	{2 27} {8 9} {8 10} {9 8} {12 6} {14 5}
1736	{2 28} {3 21} {4 18} {5 14} {15 5} {18 4} {22 3}
1800	{6 13} {11 7} {13 6} {19 4} {23 3}
1864	{3 22} {7 12} {8 11} {9 9} {9 10} {10 8} {16 5} {24 3}
1928	{4 19} {5 15} {12 7} {14 6} {20 4} {25 3}
2024	{3 23} {5 16} {5 17} {6 14} {11 8} {17 5} {21 4}

2088	{4 20} {7 13} {9 11} {10 9} {10 10} {13 7} {15 6} {18 5} {22 4}
2152	{3 24} {5 18} {8 12} {23 4}
2216	{12 8} {16 6} {19 5}
2280	{3 25} {4 21} {6 15} {10 11} {11 9} {11 10} {14 7} {24 4}
2408	{3 26} {5 19} {6 16} {6 17} {7 14} {8 13} {9 12} {13 8} {15 7} {17 6} {20 5} {21 5} {25 4}
2472	{3 27} {4 22} {12 9} {12 10} {18 6}
2536	{6 18} {11 11} {22 5}
2600	{3 28} {5 20} {14 8} {16 7} {19 6}
2664	{4 23} {7 15} {9 13} {10 12} {23 5}
2728	{8 14} {13 9} {13 10} {15 8} {17 7} {20 6}
2792	{5 21} {7 16} {7 17} {12 11} {24 5}
2856	{4 24} {6 19} {21 6}
2976	{4 25} {7 18} {8 15} {10 13} {11 12} {13 11} {14 9} {14 10} {16 8} {18 7} {25 5}
3104	{5 22} {6 20} {9 14} {15 9} {15 10} {17 8} {19 7} {22 6}
3240	{4 26} {8 16} {8 17} {12 12} {14 11} {20 7} {23 6}
3368	{4 27} {5 23} {6 21} {7 19} {9 15} {10 14} {11 13} {16 9} {16 10} {18 8} {21 7} {24 6}
3496	{4 28} {8 18} {13 12} {15 11} {17 9} {19 8} {25 6}
3624	{5 24} {7 20} {9 16} {9 17} {12 13} {17 10} {22 7}
3752	{5 25} {6 22} {10 15} {11 14} {14 12} {16 11} {18 9} {18 10} {20 8} {23 7}
3824	{8 19}
3840	{9 18} {13 13} {21 8} {24 7}
3904	{6 23} {7 21} {17 11} {19 9} {19 10}
3968	{5 26} {10 16} {10 17} {15 12} {25 7}
4032	{12 14} {22 8}
4096	{5 27} {8 20} {11 15} {14 13} {18 11} {20 9} {20 10}
4224	{6 24} {7 22} {9 19} {10 18} {16 12} {23 8}
4352	{5 28} {11 16} {11 17} {13 14} {19 11} {21 9} {21 10} {24 8}
4480	{6 25} {8 21} {12 15} {15 13} {17 12} {22 9} {22 10}
4608	{7 23} {9 20} {11 18} {20 11} {25 8}
4736	{6 26} {10 19} {12 16} {12 17} {14 14} {16 13} {18 12} {23 9} {23 10}
4864	{7 24} {8 22} {13 15} {21 11}
4992	{6 27} {9 21} {15 14} {17 13} {19 12} {22 11} {24 9} {24 10}
5120	{6 28} {10 20} {11 19} {12 18} {13 17} {25 9} {25 10}
5248	{7 25} {8 23} {13 16} {14 15} {20 12} {23 11}
5376	{16 14} {18 13}
5504	{7 26} {9 22} {13 18} {21 12} {24 11}
5632	{8 24} {10 21} {11 20} {12 19} {14 16} {14 17} {15 15} {19 13}
5760	{7 27} {17 14} {22 12} {25 11}
5888	{9 23} {14 18} {20 13}
6016	{7 28} {8 25} {10 22} {15 16} {15 17} {16 15} {18 14} {23 12}
6144	{11 21} {12 20} {13 19}
6272	{9 24} {21 13} {24 12}
6400	{8 26} {15 18} {16 16} {16 17} {17 15} {19 14}
6528	{10 23} {14 19} {22 13} {25 12}
6656	{8 27} {11 22} {13 20} {20 14}
6784	{9 25} {12 21} {16 18} {17 16} {17 17} {18 15} {23 13}
6912	{8 28}
7040	{10 24} {15 19} {21 14}
7168	{9 26} {11 23} {14 20} {17 18} {18 16} {18 17} {19 15} {24 13}
7296	{12 22} {13 21}
7424	{9 27} {20 15} {22 14} {25 13}
7552	{10 25} {16 19} {19 16} {19 17}
7680	{11 24} {18 18} {23 14}
7808	{9 28} {12 23} {14 21} {15 20} {21 15}
7936	{10 26} {13 22} {20 16} {20 17}
8064	{17 19} {19 18} {24 14}
8192	{10 27} {11 25} {16 20} {22 15}
8456	{12 24} {13 23} {14 22} {15 21} {18 19} {20 18} {21 16} {21 17} {25 14}
8712	{10 28} {11 26} {17 20} {22 16} {22 17} {23 15}
8968	{12 25} {16 21} {19 19} {21 18} {24 15}
9224	{11 27} {13 24} {14 23} {15 22} {18 20} {23 16} {23 17}
9480	{11 28} {12 26} {17 21} {20 19} {22 18} {24 16} {24 17} {25 15}
9736	{13 25} {14 24} {15 23} {16 22} {19 20} {23 18}
9992	{12 27} {18 21} {21 19} {25 16} {25 17}
10248	{13 26} {17 22} {20 20} {24 18}

10504	{12 28} {14 25} {15 24} {16 23} {22 19}
10760	{13 27} {19 21} {21 20} {23 19} {25 18}
11016	{18 22}
11272	{13 28} {14 26} {15 25} {16 24} {17 23} {20 21} {22 20} {24 19}
11528	{14 27} {19 22}
11784	{18 23} {21 21} {23 20} {25 19}
12040	{14 28} {15 26} {16 25} {17 24} {20 22}
12296	{22 21} {24 20}
12552	{15 27} {19 23}
12808	{16 26} {17 25} {18 24} {21 22} {23 21}
13064	{15 28} {20 23} {25 20}
13320	{16 27} {19 24} {22 22}
13576	{17 26} {18 25} {24 21}
13832	{16 28} {21 23}
14088	{17 27} {20 24} {23 22} {25 21}
14344	{18 26} {19 25} {22 23}
14600	{17 28} {24 22}
14856	{18 27} {21 24}
15112	{19 26} {20 25} {23 23} {25 22}
15624	{18 28} {22 24}
15880	{19 27} {20 26} {21 25} {24 23}
16136	{23 24}
16392	{19 28} {20 27} {22 25} {25 23}
16896	{21 26} {24 24}
17424	{20 28} {21 27} {22 26} {23 25} {25 24}
17928	{21 28} {24 25}
18432	{22 27} {23 26}
18960	{22 28} {23 27} {24 26} {25 25}
19968	{23 28} {24 27} {25 26}
21000	{24 28} {25 27}
21504	{25 28}

B.2.2 Uplink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22])

B.2.2.1 Uplink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), UL-DMRS-add-pos = 0

Table B.2.2.1-1: Uplink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), UL-DMRS-add-pos = 0, PUSCH duration = 14

TBS	pairs of {L$_{RBs}$ I$_{MCS}$}
32	{1 0}
56	{1 1}
72	{2 0}
96	{1 2}
112	{3 0}
120	{2 1}
136	{1 3}
144	{4 0}
176	{3 1}
184	{1 4} {5 0}
192	{2 2}
224	{6 0}
240	{1 5} {4 1}
272	{1 6} {7 0}
288	{2 3} {3 2}
304	{1 7} {5 1} {8 0}
336	{9 0}
352	{1 8}
368	{6 1}
384	{1 9} {2 4} {4 2} {10 0}
432	{1 10} {3 3} {7 1} {11 0}
456	{1 11} {12 0}
480	{2 5} {5 2}
504	{1 12} {8 1} {13 0}
528	{14 0}
552	{1 13} {2 6} {9 1}
576	{3 4} {4 3} {15 0}
608	{1 14} {6 2} {10 1} {16 0}
640	{1 15} {2 7} {17 0}
672	{11 1}
704	{1 16} {2 8} {5 3} {7 2} {18 0}
736	{1 17} {3 5} {12 1} {19 0}
768	{4 4} {20 0}
808	{1 18} {2 9} {8 2} {13 1} {21 0}
848	{1 19} {2 10} {3 6} {6 3} {14 1} {22 0}
888	{1 20} {2 11} {9 2} {23 0}
928	{1 21} {3 7} {15 1} {24 0}
984	{1 22} {2 12} {4 5} {5 4} {10 2} {16 1} {25 0}
1032	{1 23} {7 3} {17 1}
1064	{1 24} {3 8} {11 2}
1128	{1 25} {2 13} {4 6} {18 1}
1160	{1 26} {6 4} {8 3} {19 1}
1192	{1 27} {2 14} {3 9} {5 5} {12 2}
1224	{20 1}
1256	{3 10} {4 7}
1288	{2 15} {9 3} {13 2} {21 1}
1320	{3 11}
1352	{7 4} {22 1}
1416	{2 16} {4 8} {5 6} {10 3} {14 2} {23 1}
1480	{2 17} {3 12} {6 5} {15 2} {24 1}
1544	{5 7} {8 4} {25 1}
1608	{2 18} {3 13} {4 9} {11 3} {16 2}
1672	{2 19} {4 10} {6 6} {7 5} {17 2}
1736	{2 20} {9 4} {12 3}
1800	{2 21} {3 14} {4 11} {5 8} {18 2}
1864	{6 7} {13 3} {19 2}
1928	{2 22} {3 15} {7 6} {8 5} {10 4}
2024	{2 23} {4 12} {5 9} {14 3} {20 2}
2088	{3 16} {5 10} {6 8} {11 4} {21 2}
2152	{2 24} {4 13} {7 7} {9 5} {15 3} {22 2}
2216	{3 17} {5 11} {8 6}
2280	{2 25} {12 4} {16 3} {23 2}
2408	{2 26} {2 27} {3 18} {4 14} {6 9} {10 5} {17 3} {24 2}
2472	{3 19} {5 12} {7 8} {8 7} {9 6} {13 4} {25 2}

2536	{4 15} {6 10} {18 3}
2600	{3 20}
2664	{6 11} {11 5} {14 4}
2728	{3 21} {4 16} {5 13} {7 9} {10 6} {19 3}
2792	{8 8} {9 7}
2856	{3 22} {12 5} {15 4} {20 3}
2976	{4 17} {5 14} {6 12} {7 10} {21 3}
3104	{3 23} {4 18} {7 11} {8 9} {10 7} {11 6} {13 5} {16 4} {22 3}
3240	{3 24} {5 15} {6 13} {9 8} {17 4}
3368	{3 25} {4 19} {8 10} {12 6} {14 5} {23 3}
3496	{3 26} {4 20} {5 16} {6 14} {7 12} {9 9} {10 8} {11 7} {18 4} {24 3}
3624	{3 27} {4 21} {8 11} {13 6} {15 5} {19 4} {25 3}
3752	{5 17} {7 13} {9 10} {12 7}
3776	{16 5}
3824	{4 22} {6 15} {20 4}
3840	{11 8} {14 6}
3904	{5 18} {8 12} {10 9}
3968	{9 11} {21 4}
4032	{4 23} {13 7} {17 5}
4096	{5 19} {6 16} {7 14} {10 10} {15 6}
4224	{4 24} {8 13} {11 9} {12 8} {18 5} {22 4}
4352	{5 20} {6 17} {7 15} {9 12} {10 11} {14 7} {16 6} {23 4}
4480	{4 25} {5 21} {13 8} {19 5}
4608	{4 26} {6 18} {8 14} {11 10} {12 9} {15 7} {17 6} {24 4}
4736	{4 27} {5 22} {7 16} {20 5} {25 4}
4864	{9 13} {10 12} {11 11} {14 8} {18 6}
4992	{5 23} {6 19} {8 15} {12 10} {13 9} {16 7} {21 5}
5120	{6 20} {7 17}
5248	{5 24} {9 14} {12 11} {15 8} {17 7} {19 6} {22 5}
5376	{6 21} {7 18} {8 16} {10 13} {11 12} {13 10} {14 9}
5504	{18 7} {20 6} {23 5}
5632	{5 25} {9 15} {16 8}
5760	{5 26} {6 22} {7 19} {10 14} {13 11} {14 10} {15 9} {21 6} {24 5}
5888	{8 17} {11 13} {12 12} {17 8} {19 7}
6016	{5 27} {6 23} {7 20} {22 6} {25 5}
6144	{9 16} {14 11} {20 7}
6272	{7 21} {8 18} {10 15} {15 10} {16 9} {18 8} {23 6}
6400	{6 24} {11 14} {12 13} {13 12}
6528	{9 17} {21 7} {24 6}
6656	{6 25} {7 22} {8 19} {15 11} {16 10} {17 9} {19 8}
6784	{10 16} {14 12} {22 7} {25 6}
6912	{6 26} {8 20} {11 15} {13 13} {20 8}
7040	{7 23} {9 18} {12 14} {16 11} {17 10} {18 9}
7168	{6 27} {8 21} {23 7}
7296	{10 17} {15 12} {21 8}
7424	{7 24} {9 19} {11 16} {18 10} {19 9} {24 7}
7552	{8 22} {12 15} {13 14} {14 13} {17 11}
7680	{22 8} {25 7}
7808	{7 25} {9 20} {10 18} {16 12} {20 9}
7936	{18 11} {19 10}
8064	{7 26} {8 23} {9 21} {11 17} {15 13} {23 8}
8192	{10 19} {12 16} {13 15} {14 14} {17 12} {20 10} {21 9}
8456	{7 27} {8 24} {9 22} {11 18} {19 11} {22 9} {24 8}
8712	{10 20} {12 17} {14 15} {15 14} {16 13} {18 12} {20 11} {21 10} {25 8}
8968	{8 25} {9 23} {10 21} {13 16} {23 9}
9224	{8 26} {11 19} {12 18} {16 14} {17 13} {19 12} {21 11} {22 10} {24 9}
9480	{8 27} {9 24} {10 22} {11 20} {13 17} {14 16} {15 15} {23 10}
9736	{18 13} {20 12} {22 11} {25 9}
9992	{9 25} {10 23} {11 21} {12 19} {16 15} {17 14} {24 10}
10248	{12 20} {13 18} {14 17} {15 16} {19 13} {21 12} {23 11}
10504	{9 26} {10 24} {11 22} {18 14} {24 11} {25 10}
10760	{9 27} {12 21} {13 19} {17 15} {20 13} {22 12}
11016	{11 23} {14 18} {15 17} {16 16} {19 14} {25 11}
11272	{10 25} {13 20} {18 15} {21 13} {23 12}
11528	{10 26} {12 22} {14 19} {17 16}

11784	{11 24} {13 21} {15 18} {16 17} {20 14} {22 13} {24 12}
12040	{10 27} {12 23} {14 20} {19 15}
12296	{11 25} {13 22} {15 19} {18 16} {21 14} {23 13} {25 12}
12552	{14 21} {16 18} {17 17} {20 15}
12808	{11 26} {12 24} {22 14} {24 13}
13064	{11 27} {13 23} {15 20} {18 17} {19 16}
13320	{12 25} {14 22} {16 19} {17 18} {21 15} {23 14} {25 13}
13576	{15 21} {20 16}
13832	{12 26} {13 24} {16 20} {19 17} {22 15}
14088	{14 23} {17 19} {18 18} {24 14}
14344	{12 27} {15 22} {16 21} {21 16}
14600	{13 25} {17 20} {20 17} {23 15} {25 14}
14856	{14 24} {18 19} {19 18}
15112	{13 26} {15 23} {22 16} {24 15}
15368	{16 22} {17 21} {21 17}
15624	{13 27} {14 25} {18 20} {19 19} {20 18} {23 16}
15880	{15 24} {25 15}
16136	{14 26} {16 23} {17 22} {18 21} {22 17}
16392	{19 20} {20 19} {21 18} {24 16}
16896	{14 27} {15 25} {16 24} {17 23} {19 21} {22 18} {23 17} {25 16}
17424	{15 26} {18 22} {20 20} {21 19} {24 17}
17928	{15 27} {16 25} {17 24} {18 23} {19 22} {20 21} {21 20} {23 18}
18432	{16 26} {22 19} {25 17}
18960	{16 27} {17 25} {18 24} {19 23} {20 22} {21 21} {22 20} {23 19} {24 18}
19464	{17 26} {25 18}
19968	{18 25} {19 24} {20 23} {21 22} {22 21} {23 20} {24 19}
20496	{17 27} {23 21} {24 20} {25 19}
21000	{18 26} {21 23} {22 22}
21504	{18 27} {19 25} {20 24} {24 21} {25 20}
22032	{19 26} {22 23} {23 22}
22536	{19 27} {20 25} {21 24} {25 21}
23040	{20 26} {23 23} {24 22}
23568	{21 25} {22 24}
24072	{20 27} {24 23} {25 22}
24576	{21 26} {22 25} {23 24}
25104	{21 27} {25 23}
25608	{22 26} {23 25} {24 24}
26632	{22 27} {23 26} {24 25} {25 24}
27656	{23 27} {24 26}
28168	{25 25}
28680	{24 27}
29192	{25 26}
30216	{25 27}

B.2.2.2   Uplink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]), UL-DMRS-add-pos = 1

Table B.2.2.2-1: Uplink TBS using MCS table 5.1.3.1-2 (TS 38.214 [22]),
UL-DMRS-add-pos = 1, PUSCH duration = 14

TBS	pairs of {L_{RBs} I_{MCS}}
32	{1 0}
56	{1 1}
72	{2 0}
88	{1 2}
104	{3 0}
112	{2 1}
136	{1 3}
144	{4 0}
176	{1 4} {3 1} {5 0}
184	{2 2}
224	{1 5} {6 0}
240	{4 1}
256	{7 0}
272	{1 6} {2 3}
288	{3 2} {5 1} {8 0}
304	{1 7}
336	{1 8} {9 0}
352	{6 1}
368	{1 9} {2 4} {4 2} {10 0}
408	{1 10} {3 3} {7 1} {11 0}
432	{1 11} {12 0}
456	{2 5}
480	{1 12} {5 2} {8 1} {13 0}
504	{14 0}
528	{1 13} {2 6} {9 1}
552	{3 4} {4 3} {15 0}
576	{1 14} {6 2}
608	{1 15} {2 7} {10 1} {16 0}
640	{11 1} {17 0}
672	{1 16} {2 8} {7 2} {18 0}
704	{1 17} {3 5} {5 3} {12 1} {19 0}
736	{4 4} {20 0}
768	{1 18} {2 9} {8 2} {13 1} {21 0}
808	{1 19} {2 10} {3 6} {22 0}
848	{1 20} {2 11} {6 3} {9 2} {14 1} {23 0}
888	{1 21} {3 7} {15 1} {24 0}
928	{1 22} {4 5} {5 4} {25 0}
984	{1 23} {2 12} {7 3} {10 2} {16 1}
1032	{1 24} {2 13} {3 8} {11 2} {17 1}
1064	{4 6} {18 1}
1128	{1 25} {1 26} {2 14} {3 9} {6 4} {8 3} {12 2} {19 1}
1160	{1 27} {5 5}
1192	{4 7} {20 1}
1224	{2 15} {3 10} {9 3} {13 2}
1256	{21 1}
1288	{3 11} {7 4} {22 1}
1320	{2 16} {5 6} {14 2}
1352	{4 8} {23 1}
1416	{2 17} {3 12} {6 5} {10 3} {15 2} {24 1}
1480	{8 4} {25 1}
1544	{2 18} {4 9} {5 7} {11 3} {16 2}
1608	{2 19} {3 13} {4 10} {6 6} {7 5} {17 2}
1672	{2 20} {9 4} {12 3}
1736	{2 21} {3 14} {4 11} {5 8} {18 2}
1800	{6 7} {13 3} {19 2}
1864	{2 22} {3 15} {7 6} {8 5} {10 4}
1928	{4 12} {5 9} {14 3} {20 2}
2024	{2 23} {3 16} {5 10} {6 8} {11 4} {21 2}
2088	{2 24} {4 13} {7 7} {9 5} {15 3} {22 2}
2152	{2 25} {3 17} {5 11} {8 6} {23 2}
2216	{2 26} {12 4} {16 3}
2280	{3 18} {4 14} {6 9} {10 5} {24 2}
2408	{2 27} {3 19} {5 12} {6 10} {7 8} {8 7} {9 6} {13 4} {17 3} {25 2}
2472	{3 20} {4 15} {18 3}

2536	{6 11} {11 5}
2600	{3 21} {5 13} {14 4} {19 3}
2664	{4 16} {7 9} {9 7} {10 6}
2728	{8 8} {15 4} {20 3}
2792	{3 22} {5 14} {7 10} {12 5}
2856	{4 17} {6 12} {21 3}
2976	{3 23} {4 18} {7 11} {8 9} {10 7} {11 6} {13 5} {16 4}
3104	{3 24} {5 15} {6 13} {9 8} {17 4} {22 3}
3240	{3 25} {4 19} {8 10} {12 6} {14 5} {23 3}
3368	{3 26} {4 20} {5 16} {6 14} {7 12} {9 9} {10 8} {11 7} {18 4} {24 3}
3496	{3 27} {4 21} {8 11} {13 6} {15 5} {19 4} {25 3}
3624	{5 17} {7 13} {9 10} {12 7}
3752	{4 22} {5 18} {6 15} {10 9} {11 8} {14 6} {16 5} {20 4}
3824	{8 12}
3840	{4 23} {9 11} {13 7} {21 4}
3904	{6 16} {7 14} {17 5}
3968	{5 19} {10 10} {15 6}
4032	{12 8} {22 4}
4096	{4 24} {5 20} {8 13} {11 9} {14 7} {18 5}
4224	{6 17} {7 15} {9 12} {10 11} {16 6} {23 4}
4352	{4 25} {5 21} {11 10} {13 8} {19 5} {24 4}
4480	{4 26} {6 18} {8 14} {12 9} {15 7} {17 6}
4608	{4 27} {5 22} {7 16} {9 13} {11 11} {20 5} {25 4}
4736	{6 19} {10 12} {12 10} {14 8} {16 7} {18 6}
4864	{5 23} {7 17} {8 15} {13 9} {21 5}
4992	{6 20} {9 14} {15 8} {17 7} {19 6} {22 5}
5120	{5 24} {6 21} {10 13} {11 12} {12 11}
5248	{7 18} {8 16} {13 10} {14 9} {20 6} {23 5}
5376	{5 25} {16 8} {18 7}
5504	{5 26} {6 22} {7 19} {9 15} {13 11} {21 6} {24 5}
5632	{8 17} {10 14} {11 13} {12 12} {14 10} {15 9} {19 7}
5760	{5 27} {6 23} {7 20} {17 8} {22 6} {25 5}
5888	{9 16} {14 11} {20 7}
6016	{7 21} {8 18} {10 15} {15 10} {16 9} {18 8} {23 6}
6144	{6 24} {11 14} {12 13} {13 12}
6272	{9 17} {21 7} {24 6}
6400	{6 25} {7 22} {8 19} {15 11} {16 10} {17 9} {19 8}
6528	{10 16} {14 12} {22 7} {25 6}
6656	{6 26} {8 20} {11 15} {13 13} {20 8}
6784	{7 23} {9 18} {12 14} {16 11} {17 10} {18 9} {23 7}
6912	{6 27} {8 21}
7040	{10 17} {15 12} {21 8}
7168	{7 24} {9 19} {11 16} {14 13} {17 11} {18 10} {19 9} {24 7}
7296	{8 22} {12 15} {13 14}
7424	{9 20} {20 9} {22 8} {25 7}
7552	{7 25} {10 18} {16 12} {19 10}
7680	{11 17} {18 11} {23 8}
7808	{7 26} {8 23} {9 21} {12 16} {14 14} {15 13} {21 9}
7936	{10 19} {13 15} {20 10}
8064	{7 27} {17 12} {19 11} {24 8}
8192	{8 24} {9 22} {10 20} {11 18} {16 13} {22 9}
8456	{12 17} {13 16} {14 15} {15 14} {18 12} {20 11} {21 10} {25 8}
8712	{8 25} {9 23} {10 21} {11 19} {17 13} {22 10} {23 9}
8968	{8 26} {12 18} {16 14} {19 12} {21 11} {24 9}
9224	{8 27} {9 24} {10 22} {11 20} {13 17} {14 16} {15 15} {18 13} {23 10}
9480	{11 21} {12 19} {17 14} {20 12} {22 11} {24 10} {25 9}
9736	{9 25} {10 23} {13 18} {14 17} {15 16} {16 15} {19 13} {23 11}
9992	{9 26} {11 22} {12 20} {18 14} {21 12} {25 10}
10248	{10 24} {13 19} {17 15} {20 13} {24 11}
10504	{9 27} {12 21} {14 18} {15 17} {16 16} {22 12}
10760	{10 25} {11 23} {13 20} {19 14} {21 13} {23 12} {25 11}
11016	{12 22} {18 15}
11272	{10 26} {11 24} {13 21} {14 19} {15 18} {16 17} {17 16} {20 14} {22 13} {24 12}
11528	{10 27} {12 23} {14 20} {19 15}
11784	{11 25} {18 16} {21 14} {23 13} {25 12}

12040	{13 22} {14 21} {15 19} {16 18} {17 17} {20 15}
12296	{11 26} {12 24} {22 14} {24 13}
12552	{13 23} {15 20} {19 16}
12808	{11 27} {12 25} {14 22} {16 19} {17 18} {18 17} {21 15} {23 14}
13064	{15 21} {20 16} {25 13}
13320	{12 26} {13 24} {16 20} {19 17} {22 15}
13576	{14 23} {17 19} {18 18} {24 14}
13832	{12 27} {15 22} {16 21} {21 16}
14088	{13 25} {17 20} {20 17} {23 15} {25 14}
14344	{14 24} {18 19} {19 18} {22 16}
14600	{13 26} {15 23} {16 22} {17 21} {24 15}
14856	{18 20} {21 17}
15112	{13 27} {14 25} {19 19} {20 18} {23 16} {25 15}
15368	{15 24}
15624	{14 26} {16 23} {17 22} {18 21} {22 17}
15880	{19 20} {20 19} {21 18} {24 16}
16136	{14 27} {15 25} {23 17}
16392	{16 24} {17 23} {18 22} {19 21} {20 20} {22 18} {25 16}
16896	{15 26} {21 19} {24 17}
17424	{15 27} {16 25} {17 24} {18 23} {19 22} {20 21} {21 20} {22 19} {23 18} {25 17}
17928	{16 26} {21 21} {24 18}
18432	{16 27} {17 25} {18 24} {19 23} {20 22} {22 20} {23 19}
18960	{17 26} {22 21} {23 20} {24 19} {25 18}
19464	{17 27} {18 25} {19 24} {20 23} {21 22}
19968	{18 26} {22 22} {23 21} {24 20} {25 19}
20496	{19 25} {20 24} {21 23}
21000	{18 27} {19 26} {23 22} {24 21} {25 20}
21504	{20 25} {21 24} {22 23} {25 21}
22032	{19 27} {24 22}
22536	{20 26} {21 25} {22 24} {23 23}
23040	{20 27} {24 23} {25 22}
23568	{21 26} {22 25} {23 24}
24072	{21 27} {25 23}
24576	{22 26} {23 25} {24 24}
25608	{22 27} {23 26} {25 24}
26120	{24 25}
26632	{23 27} {24 26}
27144	{25 25}
27656	{24 27} {25 26}
28680	{25 27}

Annex C (informative):
Style guide and design principles

C.1 Style guide

The style guide specified in TS 36.523-3 [12] Annex B applies to the present document.

C.2 Design principles

The design principles specified in TS 36.523-3 [12] Annex B apply to the present document.

Annex D (normative): TTCN-3 definitions

D.0 Introduction

The present Annex D specifies the TTCN-3 type definitions used at the system interface to configure and control the SS.

In case of discrepancy between the content of the present Annex D and the equivalent TTCN-3 definitions / semantic requirements found in the TTCN modules provided as attachments to the present specification, the latter shall take precedence.

NOTE: This annex is automatically generated from the TTCN-3 modules provided as attachment to the present specification and containing the listed TTCN-3 type definitions,

D.1 NR_ASP_TypeDefs

Type definitions for configuration of the system simulator;
Common design principles:
Semantics of OMIT: unless specified otherwise, for all TTCN-3 type definitions used in ASPs omit means "keep as it is" =>
- on initial configuration in general all fields shall be provided
- no default values for fields are foreseen
- if necessary non-existence of information shall be explicitly configured
  (e.g. with a union of "no configuration" and "configuration parameters"
- fields within structures imported from the core spec are excepted from this rule
- if a sub-structure is explicitly excluded from this rule all fields and sub-fields shall be fully specified for each (re-)configuration

D.1.1 ASN1_Container

Definitions containing ASN.1 types for backward compatibility

NR_ASN1_UL_AM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_UL_AM_RLC_Type**	
Comment		
R15	UL_AM_RLC	

NR_ASN1_DL_AM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_DL_AM_RLC_Type**	
Comment		
R15	DL_AM_RLC	

NR_ASN1_UL_UM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_UL_UM_RLC_Type**	
Comment		
R15	UL_UM_RLC	

NR_ASN1_DL_UM_RLC_Type

TTCN-3 Union Type	
Name	**NR_ASN1_DL_UM_RLC_Type**
Comment	
R15	DL_UM_RLC

NR_ASN1_PDSCH_Config_Type

TTCN-3 Union Type	
Name	**NR_ASN1_PDSCH_Config_Type**
Comment	
R15	PDSCH_Config

NR_ASN1_PDSCH_ConfigCommon_Type

TTCN-3 Union Type	
Name	**NR_ASN1_PDSCH_ConfigCommon_Type**
Comment	
R15	PDSCH_ConfigCommon

NR_ASN1_SPS_Config_Type

TTCN-3 Union Type	
Name	**NR_ASN1_SPS_Config_Type**
Comment	
R15	SPS_Config

NR_ASN1_CSI_ResourceConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_CSI_ResourceConfig_Type**
Comment	
R15	CSI_ResourceConfig

NR_ASN1_TDD_UL_DL_ConfigCommon_Type

TTCN-3 Union Type	
Name	**NR_ASN1_TDD_UL_DL_ConfigCommon_Type**
Comment	
R15	TDD_UL_DL_ConfigCommon

NR_ASN1_TDD_UL_DL_SlotConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_TDD_UL_DL_SlotConfig_Type**
Comment	
R15	TDD_UL_DL_SlotConfig

NR_ASN1_FrequencyInfoDL_Type

TTCN-3 Union Type	
Name	**NR_ASN1_FrequencyInfoDL_Type**
Comment	
R15	FrequencyInfoDL

NR_ASN1_FrequencyInfoUL_Type

TTCN-3 Union Type	
Name	**NR_ASN1_FrequencyInfoUL_Type**
Comment	
R15	FrequencyInfoUL

NR_ASN1_BWP_UplinkCommon_Type

TTCN-3 Union Type	
Name	**NR_ASN1_BWP_UplinkCommon_Type**
Comment	
R15	BWP_UplinkCommon

NR_ASN1_BWP_UplinkDedicated_Type

TTCN-3 Union Type	
Name	**NR_ASN1_BWP_UplinkDedicated_Type**
Comment	
R15	BWP_UplinkDedicated

NR_ASN1_RACH_ConfigDedicated_Type

TTCN-3 Union Type	
Name	**NR_ASN1_RACH_ConfigDedicated_Type**
Comment	
R15	RACH_ConfigDedicated

NR_ASN1_PDSCH_ServingCellConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_PDSCH_ServingCellConfig_Type**
Comment	
R15	PDSCH_ServingCellConfig

NR_ASN1_PUSCH_ServingCellConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_PUSCH_ServingCellConfig_Type**
Comment	
R15	PUSCH_ServingCellConfig

NR_ASN1_SearchSpace_Type

TTCN-3 Union Type	
Name	**NR_ASN1_SearchSpace_Type**
Comment	
R15	SearchSpace

NR_ASN1_ControlResourceSet_Type

TTCN-3 Union Type	
Name	**NR_ASN1_ControlResourceSet_Type**
Comment	
R15	ControlResourceSet

NR_ASN1_BWP_Type

TTCN-3 Union Type	
Name	**NR_ASN1_BWP_Type**
Comment	
R15	BWP

NR_ASN1_DRX_Config_Type

TTCN-3 Union Type	
Name	**NR_ASN1_DRX_Config_Type**
Comment	
R15	DRX_Config

NR_ASN1_MeasGapConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_MeasGapConfig_Type**
Comment	
R15	MeasGapConfig

NR_ASN1_MAC_CellGroupConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_MAC_CellGroupConfig_Type**
Comment	
R15	MAC_CellGroupConfig

NR_ASN1_PhysicalCellGroupConfig_Type

TTCN-3 Union Type	
Name	**NR_ASN1_PhysicalCellGroupConfig_Type**
Comment	
R15	PhysicalCellGroupConfig

D.1.2 System_Configuration

Formal ASP Definitions for system configuration

NR_SystemRequest_Type

TTCN-3 Union Type		
Name	**NR_SystemRequest_Type**	
Comment		
Cell	NR_CellConfigRequest_Type	configure/release a cell
CellAttenuation List	NR_CellAttenuationList_Type	power attenuation for one or several cells; all cells included in the list shall be changed at the same time; all cells in the list shall reach the new cell power within a maximum of 100ms (10 frames) !!!! NR-TBD: to be added to 38.523-3 !!!! acc. to the tolerances given in TS 38.508-1 !!!! NR-CHECK: test tolerances to be added to TS 38.508-1 !!!! NOTE: In the common ASP part the CellId shall be set - to the cell the timing information refers to if activation time shall be applied - to nr_Cell_NonSpecific when there is no activation time
RadioBearerList	NR_RadioBearerList_Type	configure/release one or several SRBs and/or DRBs at an SpCell NOTE: RBs are not configured in an SCell
EnquireTiming	Null_Type	get current timing information for the given cell
AS_Security	NR_AS_Security_Type	StartRestart/Release of AS security
SystemIndCtrl	NR_System_IndicationControl_Type	to configure SS to generate system indications
PdcpCount	NR_PDCP_CountReq_Type	to set or enquire PDCP COUNT for one or more RBs
DciTrigger	NR_DCI_Trigger_Type	to trigger a specific DCI to be transmitted on PDCCH (e.g. PDCCH order)
MacCommand Trigger	NR_MAC_ControlElementDL_Type	to trigger a specific MAC control element to be transmitted to the UE
L1_TestMode	NR_L1_TestMode_Type	To Set L1/MAC in special Test modes e.g. DL CRC etc.

NR_SystemConfirm_Type

TTCN-3 Union Type		
Name	**NR_SystemConfirm_Type**	
Comment	confirmations for system configuration; in general to be sent after the configuration has been done	
Cell	Null_Type	(no further parameters from SS)
CellAttenuation List	Null_Type	(no further parameters from SS) NOTE 1: the confirmation shall be sent when all cells have changed power levels NOTE 2: for the CellId in the common ASP part the same rules are applied as for the SYSTEM REQ
RadioBearerList	Null_Type	(no further parameters from SS)
EnquireTiming	Null_Type	the cell's timing information is contained in the TimingInfo of the ASP's common part
AS_Security	Null_Type	(no further parameters from SS)
SystemIndCtrl	Null_Type	(no further parameters from SS)
RlcIndCtrl	Null_Type	(no further parameters from SS)
PdcpCount	NR_PDCP_CountCnf_Type	as response to 'Get' a list is returned containing COUNT information for the requested RBs
DciTrigger	Null_Type	(no further parameters from SS)
MacCommand Trigger	Null_Type	(no further parameters from SS)
L1_TestMode	Null_Type	confirmation for L1 test mode

NR_SystemIndication_Type

TTCN-3 Union Type		
Name	**NR_SystemIndication_Type**	
Comment		
Error	charstring	indicates an error situation in SS; is not explicitly handled in TTCN but causes an INCONC due to default behaviour; an additional error code can be signalled in the common part of the ASP; SS shall raise an error when in TS 38.523-3 or in any other ASP definitions
RlcDiscardInd	NR_RlcDiscardInd_Type	indicates discarded PDUs
MAC	NR_MAC_ControlElementUL_Type	indicates MAC control element being receive from the UE
RachPreamble	NR_RachPreamble_Type	RACH preamble being sent by the UE
SchedReq	Null_Type	indication for scheduling request sent by the UE
UL_HARQ	HARQ_Type	to report the UL HARQ as received on PUCCH or PUSCH for corresponding DL transmission
HarqError	NR_HarqError_Type	indicates detection of HARQ error: 1. HARQ CRC error for UL data 2. HARQ NACK from the UE unless SS is configured to report HARQ ACK/NACK

D.1.3   Cell_Configuration

Specific Info for Cell Configuration Primitive

D.1.3.1   Cell_Configuration_Common

NR_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_NR_CellAttenuation_Off	NR_Attenuation_Type	{Off:=true}	

Cell_Configuration_Common: Basic Type Definitions

TTCN-3 Basic Types		
NR_InitialAttenuation_Type	NR_Attenuation_Type (tsc_NR_CellAttenuation_Off)	Attenuation restricted to 'Off'

NR_CellConfigRequest_Type

TTCN-3 Union Type		
Name	**NR_CellConfigRequest_Type**	
Comment		
AddOrReconfigure	NR_CellConfigInfo_Type	for cell configuration: CellId : identifier of the cell to be configured RoutingInfo : 'None' TimingInfo : 'Now' for initial configuration; specific TimingInfo may be used for reconfiguration ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)
Release	Null_Type	to remove a cell completely - CellId : identifier of the cell to be released; nr_Cell_NonSpecific, in case all cells shall be released RoutingInfo : 'None' TimingInfo : 'Now' ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)

NR_CellConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_CellConfigInfo_Type**		
Comment	common information for initial cell configuration or reconfiguration; in case of reconfiguration omit means 'keep configuration as it is'		
StaticResource Config	NR_SS_StaticCellResource Config_Type	opt	mandatory for the initial configuration; to be omitted afterwards
CellConfigCom mon	NR_CellConfigCommon_Ty pe	opt	common configuration parameters which are not specific to physical layer (or any other layer)
PhysicalLayer	NR_CellConfigPhysicalLay er_Type	opt	Physical layer configuration: physical channels, signals and BWPs for UL and DL; DCI
BcchConfig	NR_BcchConfig_Type	opt	configuration of BCCH/BCH; SS is triggered to configure RLC/MAC accordingly; BCCH data on the PDSCH is distinguished by the SI-RNTI PBCH: MIB; PDSCH: scheduling and resource allocation; SIBs
PcchConfig	NR_PcchConfig_Type	opt	configuration of PCCH/PCH; SS is triggered to configure RLC/MAC accordingly; PCCH data on the PDSCH is distinguished by the P-RNTI (needed even to modify SI => shall be configured for CELL_BROADCASTING)
RachProcedure Config	NR_RachProcedureConfig_ Type	opt	to configure the SS's behaviour for the RACH procedure; may be omitted at initial configuration e.g. in case that the cell shall not have an uplink; NOTE: there is no way to explicitly remove the RACH procedure configuration after it has been configured for a cell
CcchDcchDtch Config	NR_CcchDcchDtchConfig_ Type	opt	Parameters related to CCCH/DCCH/DTCH in UL and DL
ServingCellCon fig	NR_ServingCellConfig_Typ e	opt	To be configured at initial configuration of a cell: for non-CA scenarios it shall be either 'SpCell' or 'None' ('None' applies for pure neighbouring cells)

NR_SS_StaticCellResourceConfig_Type

TTCN-3 Record Type			
Name	**NR_SS_StaticCellResourceConfig_Type**		
Comment	capabilities af a cell according to the initial condition of a test case, to allow resource management at SS implementation; !!!! NR-PROSE: NR-equivalent of 36.508 clauses 6.3.3 and 6.3.4 to be added to 38.508 !!!!		
CellCapability	NR_CellCapability_Type		common cell capability
CarrierAggrega tion	NR_CellInitialCAConfig_Ty pe		Initial configuration of a cell in context of carrier aggregation

NR_CellCapability_Type

TTCN-3 Enumerated Type	
Name	**NR_CellCapability_Type**
Comment	capabilities of a cell acc. to the initial condition of a test case !!!! NR-TBD: reference to 38.508 !!!!
broadcastOnlyCell	no detection of RACH preambles required; cell is only broadcasting
minimumUplinkCell	detection of RACH preambles required but not any further RX capability
fullCell	full TX and RX capabilities

NR_CellInitialCAConfig_Type

TTCN-3 Enumerated Type	
Name	**NR_CellInitialCAConfig_Type**
Comment	static information about the cell's initial role for carrier aggregation, not being changed during a test case; may be used for resource management at the SS; !!!! NR-TBD: reference to 38.508 !!!!
SpCell	Cell can be used as SpCell during a test case (primary cell of a master or secondary cell group; TS 37.340 clause 3.1); normal case i.e. applicable even when SpCell is the only cell of the cell group
Scell_Active	Carrier Aggregation: Cell is added as SCell to a cell group and may get activated during a test case
Scell_Inactive	Carrier Aggregation: Cell is added as SCell to a cell group but will never get activated during the test case
None	e.g. when a cell is not used for connected mode during a test case (pure nighbouring cell)

NR_CellConfigCommon_Type

TTCN-3 Record Type			
Name	**NR_CellConfigCommon_Type**		
Comment	common configuration parameters which are not specific to physical layer (or any other layer)		
C_RNTI	RNTI_Value_Type	opt	(pre-)configured C-RNTI used by physical layer and by MAC layer; affects scrambling of PDSCH/PUSCH and CRC of PDCCH(s); shall be used implicitly in RACH procedure (i.e. as CE in RAR)
CellTimingInfo	CellTimingInfo_Type	opt	
InitialCellPower	NR_InitialCellPower_Type	opt	reference cell power for the RS of each antenna in DL NOTE 1: the power of the RS of an antenna may be reduced by antenna specific configuration NOTE 2: in general the power may be adjusted on a per resource element basis => all physical channel/signal power settings shall be adjusted relatively to the RS; if there are more than one TX antennas each one may have its own attenuation; independently from those relative power settings the cell power can easily be adjusted by just changing the reference power

NR_Attenuation_Type

TTCN-3 Union Type		
Name	**NR_Attenuation_Type**	
Comment	attenuation of the reference power	
Value	integer (0..149)	cell power reference power reduced by the given attenuation (value is in dB); corresponds to AbsoluteCellPower_Type
Off	Null_Type	!!!! NR-FFS: to be checked for NR; reference to 38.508 to be added !!!!

NR_InitialCellPower_Type

TTCN-3 Record Type			
Name	**NR_InitialCellPower_Type**		
Comment			
MaxReference Power	NR_AbsoluteCellPower_Type		maximum value of cell reference power (RS EPRE in dBm/15kHz as per TS 36.508, clause 4.3.4.1); !!!! NR-FFS: to be checked for NR; reference to 38.508 to be added !!!! a cell is initialised with this reference power; its value is the upper bound of the cell power during the test case
Attenuation	NR_InitialAttenuation_Type		initial attenuation

D.1.3.2 PhysicalLayer

NR_CellConfigPhysicalLayer_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayer_Type**		
Comment	Common configuration of physical channels, signals and BWPs		
Common	NR_CellConfigPhysicalLayerCommon_Type	opt	Configuration common for UL and DL
Downlink	NR_CellConfigPhysicalLayerDownlink_Type	opt	DL configuration
Uplink	NR_CellConfigPhysicalLayerUplink_Type	opt	UL configuration; may be omitted at initial configuration e.g. in case that the cell shall not have an uplink; NOTE: there is no way to explicitly remove the uplink configuration after it has been configured for a cell

D.1.3.2.1 PhysicalLayer_Common

NR_CellConfigPhysicalLayerCommon_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayerCommon_Type**		
Comment	Configuration common for UL and DL		
PhysicalCellId	PhysCellId	opt	Physical-layer cell identity according to 38.211 clause 7.4.2.1; EN-DC: corresponds to ServingCellConfigCommon.physCellId
DuplexMode	NR_DuplexMode_Type	opt	FDD or TDD; FDD/TDD specific parameters !!!! NR-NOTE: called "RAT" in EUTRA but "DuplexMode" seems to be more precise !!!!

NR_DuplexMode_Type

TTCN-3 Union Type		
Name	**NR_DuplexMode_Type**	
Comment	FDD/TDD and maybe other types of duplex mode; in general FDD/TDD mode is determined from the frequency band	
FDD	NR_FDD_Info_Type	
TDD	NR_TDD_Info_Type	

NR_FDD_Info_Type

TTCN-3 Record Type	
Name	**NR_FDD_Info_Type**
Comment	FDD specific parameters: no further parameters defined for FDD !!!! NR-NOTE: in contrast to EUTRA an empty record is used (rather than Null_Type) as it can be expanded without type change !!!!

NR_TDD_UL_DL_ConfigCommon_Type

TTCN-3 Record Type			
Name	**NR_TDD_UL_DL_ConfigCommon_Type**		
Comment	Common TDD UL/DL configuration		
Set1	NR_ASN1_TDD_UL_DL_ConfigCommon_Type		cell-specific TDD UL/DL configuration (L1 parameter UL-DL-configuration-common in TS 38.213); corresponds to ServingCellConfigCommon.tdd-UL-DL-ConfigurationCommon
Set2	NR_ASN1_TDD_UL_DL_ConfigCommon_Type	opt	cell-specific TDD UL/DL configuration (L1 parameter UL-DL-configuration-common-set2 in TS 38.213); corresponds to ServingCellConfigCommon.tdd-UL-DL-ConfigurationCommon2; omit means that there is no set2

NR_TDD_UL_DL_SlotConfigList_Type

TTCN-3 Record of Type	
Name	**NR_TDD_UL_DL_SlotConfigList_Type**
Comment	
record of NR_ASN1_TDD_UL_DL_SlotConfig_Type	

NR_TDD_Info_Type

TTCN-3 Record Type			
Name	**NR_TDD_Info_Type**		
Comment	cell specific parameters for TDD		
Common	NR_TDD_UL_DL_ConfigCommon_Type	opt	Common TDD configuration corresponding to L1 parameters UL-DL-configuration-common, UL-DL-configuration-common-set2; shall be present for TDD at initial configuration
Dedicated	NR_TDD_UL_DL_SlotConfigList_Type	opt	Dedicated TDD configuration for single slots over-ruling the common configuration; empty list per default (i.e. no dedicated slot configuration)

D.1.3.2.2   PhysicalLayer_Downlink

PhysicalLayer_Downlink: Basic Type Definitions

TTCN-3 Basic Types		
NR_EPRE_Ratio_Type	integer	Energy per resource element relative to given reference signal or abstract reference cell power (dBm)

NR_CellConfigPhysicalLayerDownlink_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayerDownlink_Type**		
Comment	physical layer configuration at the SS for the downlink of a cell !!!! NR-NOTE: there is no AntennaGroup (NR_DownlinkAntennaGroupConfig_Type); specifc antenna group configuration may be described in part 3 if needed !!!!		
FrequencyInfoDL	NR_ASN1_FrequencyInfoDL_Type	opt	carries information about location of SSB and reference resource block (point A) in frequency domain and about associated frequency bands (list of FreqBandIndicatorNR) !!!! NR-NOTE: by using ASN.1 FrequencyInfoDL there are no configuration parameters anymore like for EUTRA's CommonStaticCellInfo_Type.EutraBand, !!!! DownlinkStaticCellInfo_Type.Earfcn and DownlinkStaticCellInfo_Type.Bandwidth !!!!
SSPbchBlock	NR_SSB_Config_Type	opt	Configuration of SS/PBCH-block transmission
PdschCellLevelConfig	NR_PDSCH_CellLevelConfig_Type	opt	Cell-level configuration of PDSCH being applicable independent from the BWP a PDSCH is associated to
BWPs	NR_DownlinkBWPs_Type	opt	Configuration of DL BWPs and their associated physical channels and signals

D.1.3.2.2.1   SS_PBCH_Block

SS/PBCH block configuration according to TS 38.213 clause 4.1:
SS/PBCH block consists of synchronisation Signals (PSS and SSS) and PBCH (see e.g. TS 38.300 figure 5.2.4-1);
a demodulation reference signal (DM-RS) is frequency multiplexed on the PBCH symbols (TS 38.300 clause 5.2.4, TS 38.211 clause 7.4.1.4) and
the DM-RS sequence corresponds to the three LSBs of the SS/PBCH index (TS 38.213 clause 4.1 and TS 38.211 clause 7.4.1.4.1);
the SS/PBCH index needs to be maintained by the SS (as the system frame number);
the physical layer cell id is carried by PSS and SSS according to TS 38.211 clause 7.4.2

SS_PBCH_Block: Basic Type Definitions

TTCN-3 Basic Types		
NR_SSB_Periodicity_Type	ServingCellConfigCommon.ssb_periodicityServingCell	
NR_SSB_PositionsInBurst_Type	ServingCellConfigCommon.ssb_PositionsInBurst	"SSB-transmitted" parameter as used by the UE to rate-match around SSBs acc. 38.214 cl. 5.1; it is assumed that this can be used to fully describe all possible occurrences of SSBs in time domain in terms of SS configuration; (NOTE: similar information is provided in SIB1.ssb-PositionsInBurst ("SSB-transmitted-SIB1"))

NR_SSB_EPREs_Type

TTCN-3 Record Type			
Name	**NR_SSB_EPREs_Type**		
Comment	EPRE for PBCH and related signals		
Pbch	NR_EPRE_Ratio_Type	opt	transmit power for resource elements (REs) being occupied by SS/PBCH block according to TS 38.213 clause 4.1 the UE shall assume that SSS and PBCH DM-RS have same EPRE
Pss	NR_EPRE_Ratio_Type	opt	Primary synchronization signal; 38.211 clause 7.4.2.2
Sss	NR_EPRE_Ratio_Type	opt	Secondary synchronization signal; 38.211 clause 7.4.2.3
Dmrs	NR_EPRE_Ratio_Type	opt	DM-RS associated to PBCH (Demodulation reference signals for PBCH; 38.211 clause 7.4.1.4)

NR_SSB_Config_Type

TTCN-3 Record Type			
Name	**NR_SSB_Config_Type**		
Comment	Synchronization signals and PBCH; TS 38.211 clause 7.4.3, TS 38.300 clause 5.2.4; NOTE: SSB location in frequency domain is specified by parameter of FrequencyInfoDL being provided by NR_CellConfigPhysicalLayerDownlink_Type.FrequencyInfoDL: - absoluteFrequencyPointA: Corresponds to L1 parameter "offset-ref-low-scs-ref-PRB" (see TS 38.211 clause 7.4.3.1) - ssb-SubcarrierOffset: frequency domain offset between SSB and the overall resource block grid in number of subcarriers (see TS 38.211 clause 7.4.3.1)		
SubCarrierSpacing	SubcarrierSpacing	opt	sub-carrier spacing for SS/PBCH block (as specified by ServingCellConfigCommon.subcarrierSpacing in case of non-initial access): According to comments for ServingCellConfigCommon.subcarrierSpacing "Only the values 15 or 30 kHz (<6GHz), 120 or 240 kHz (>6GHz) are applicable"; this corresponds to tables 13-1 .. 13.10 in TS 38.213 where only 15 or 30 kHz and 120 or 240 kHz are considered for SS/PBCH block sub-carrier spacing; and it corresponds to 38.211 clause 7.4.3.1 defining SS/PBCH block type A as numerology=0,1 and type B as numerology=3,4 (i.e. there is no numerology=2 for SS/PBCH block) NOTE 1: in contrast to SS/PBCH block sub-carrier spacing the sub-carrier spacing for SIB1, Msg.2/4 for initial access and broadcast SI-messages is restricted to 15kHz or 30kHz for carrier frequency <= 6 GHz and 60kHz or 120kHz for carrier frequency > 6 GHz (see comments for MIB.subCarrierSpacingCommon and TS 38.213 tables 13-1 .. 13.10) NOTE 2: As long as there is no sub-carrier spacing of 60kHz (numerology=2) for the SS/PBCH block acc. to TS 38.211 Table 4.2-1 there is no extended cyclic prefix either (even though Table 4.2-1 is mainly for BWP there is no indication for any extended cyclic prefix for SS/PBCH block) => there is no need to specify the cyclic prefix for SS/PBCH block configuration (normal cyclic prefix is assumed for all cases)
Periodicity	NR_SSB_Periodicity_Type	opt	in multiples of half frames (5ms)
PositionsInBurst	NR_SSB_PositionsInBurst_Type	opt	to specify a bitmap for the SS/PBCH block candidates which are eventually used for transmission of SS/PBCH blocks in a half frame; the number of bits depends on the numerology of the SS/PBCH block and the carrier frequency; (38.213 clause 4.1)
RelativeTxPower	NR_SSB_EPREs_Type	opt	transmit power for PBCH and SS/PBCH signals NOTE: Parameter SS-PBCHBlockPower is provided to the UE in SIB1.ss-PBCH-BlockPower, ServingCellConfigCommon.ss-PBCH-BlockPower) as referenceSignalPower; The UE uses referenceSignalPower to determine the transmission power of the PRACH (TS 38.213 clause 7.4) => For signalling tests there seems to be no need to provide this parameter to the SS (nevertheless the value provided to the UE shall not conflict with the power settings for the SSB at the SS)

D.1.3.2.2.2 Cell_Level_Configuration_PDSCH

Cell_Level_Configuration_PDSCH: Basic Type Definitions

TTCN-3 Basic Types		
NR_PDSCH_DMRS_TypeA_Position_Type	MIB.dmrs_TypeA_Position	same as ServingCellConfigCommon.dmrs-TypeA-Position

NR_PDSCH_CellLevelConfig_Type

TTCN-3 Record Type			
Name	**NR_PDSCH_CellLevelConfig_Type**		
Comment	cell-level parameters for PDSCH: in contrast to BWP specific parameters the cell-level parameters apply to any PDSCH independent from the BWP a PDSCH is associated to		
DMRS_TypeA_ Position	NR_PDSCH_DMRS_TypeA _Position_Type	opt	The UE gets provided L1 parameter "DL-DMRS-typeA-pos" by MIB.dmrs-TypeA-Position or ServingCellConfigCommon.dmrs-TypeA-Position; DL-DMRS-typeA-pos defines position of the first DM-RS symbol in the sequence of DM-RS symbols according to TS 38.211 clause 7.4.1.1.
RateMatchPatt ern	NR_CellLevelRateMatchPat tern_Type	opt	rate match pattern according to TS 38.214 clause 5.1.4
ServingCellCon fig	NR_ASN1_PDSCH_Servin gCellConfig_Type	opt	PDSCH related parameters not being BWP-specific; corresponds to ServingCellConfig.pdsch-ServingCellConfig

NR_RateMatchPatternList_Type

TTCN-3 Record of Type	
Name	**NR_RateMatchPatternList_Type**
Comment	
record of RateMatchPattern	

NR_RateMatchPatternLteCrsList_Type

TTCN-3 Record of Type	
Name	**NR_RateMatchPatternLteCrsList_Type**
Comment	
record of RateMatchPatternLTE_CRS	

NR_CellLevelRateMatchPattern_Type

TTCN-3 Record Type			
Name	**NR_CellLevelRateMatchPattern_Type**		
Comment	configuration of rate match pattern on cell level (see TS 38.214 clause 5.1.4)		
PatternList	NR_RateMatchPatternList_ Type	opt	up to 4 cell-level RateMatchPattern according to TS 38.214 clause 5.1.4 (L1 parameter rate-match-PDSCH-bitmap1..3); corresponds to ServingCellConfigCommon.rateMatchPatternToAddModList/rate MatchPatternToReleaseList; empty list per default (i.e. at initial configuration)
PatternListLteC rs	NR_RateMatchPatternLteC rsList_Type	opt	0 or 1 LTE CRS pattern to rate match around (see TS 38.214 clause 5.1.4.2) corresponds to ServingCellConfigCommon.lte-CRS-ToMatchAround; empty list per default (i.e. at initial configuration)

D.1.3.2.2.3   Downlink_BWP

NR_DownlinkBWP_Type

TTCN-3 Record Type			
Name	**NR_DownlinkBWP_Type**		
Comment	Configuration of single BWP at the SS		
Id	BWP_Id	opt	Initial BWP: 0 Dedicated BWP: 1..4
BWP	NR_ASN1_BWP_Type	opt	Frequency domain location and bandwidth, subcarrier spacing, cyclic prefix
Pdcch	NR_BWP_PDCCH_Configuration_Type	opt	
Pdsch	NR_BWP_PDSCH_Configuration_Type	opt	
Sps	NR_ASN1_SPS_Config_Type	opt	BWP-DownlinkDedicated.SPS-Config
CSI_RS_Config	NR_CSI_RS_Config_Type	opt	Configuration of CSI Reference Signals

NR_DownlinkBWP_List_Type

TTCN-3 Record of Type	
Name	**NR_DownlinkBWP_List_Type**
Comment	configuration of BWPs: each entry shall have a distinct Id with ID=0 for the initial BWP; NOTE 1: In case of the initial BWP the BWP parameters (frequency location and bandwidth) correspond to the RMSI CORESET as given by MIB.pdcch-ConfigSIB1 (L1 parameter 'RMSI-PDCCH-Config'; TS 38.213 tables 13.x). NOTE 2: Even though in general the BWP-Id corresponds to the index of the element within the array of BWPs, the SS shall not take this as assumption
record of NR_DownlinkBWP_Type	

NR_DownlinkBWPs_Type

TTCN-3 Record Type			
Name	**NR_DownlinkBWPs_Type**		
Comment	configuration of downlink BWPs		
ActiveBWP	BWP_Id	opt	Id of the currently active BWP (this does not need to be the same as the index) According to TS 38.211 clause 4.4.5: "A UE can be configured with up to four carrier bandwidth parts in the downlink with a single downlink carrier bandwidth part being active at a given time. The UE is not expected to receive PDSCH, PDCCH, CSI-RS, or TRS outside an active bandwidth part."
BwpArray	NR_DownlinkBWP_List_Type	opt	array of band width parts: initial BWP + up to 4 dedicated BWPs

D.1.3.2.2.3.1   PDSCH_Configuration

Configuration of PDSCH and its related reference signals:
- DM-RS (Demodulation reference signal); TS 38.211 clause 7.4.1.1
- PT-RS (Phase-tracking reference signals for PDSCH); TS 38.211 clause 7.4.1.2

NR_BWP_PDSCH_Configuration_Type

TTCN-3 Record Type			
Name	**NR_BWP_PDSCH_Configuration_Type**		
Comment	PDSCH configuration at the SS for specific BWP		
ConfigCommon	NR_ASN1_PDSCH_Config Common_Type	opt	
ConfigDedicated	NR_ASN1_PDSCH_Config _Type	opt	
RelativeTxPower	NR_PDSCH_EPREs_Type	opt	

NR_PDSCH_EPREs_Type

TTCN-3 Record Type			
Name	**NR_PDSCH_EPREs_Type**		
Comment	EPRE for PDSCH and related signals		
PdschToCell	NR_EPRE_Ratio_Type	opt	transmit power relative to given cell power for resource elements (REs) being occupied by PDSCH
PdschToDmrs	NR_EPRE_Ratio_Type	opt	DM-RS associated to PDSCH: relative transmit power according to TS 38.214 clause 4.1
PdschToPtrs	NR_EPRE_Ratio_Type	opt	PT-RS associated to PDSCH: relative transmit power according to TS 38.214 clause 4.1 NOTE: PT-RS need only to be considered when being present (TS 38.211 clause 7.4.1.2.2 according to TS 38.214 clause 4.1), i.e. the SS shall ignore the PT-RS's EPRE if no PT-RS is present

D.1.3.2.2.3.2   PDCCH_Configuration

Configuration of PDSCH and its related reference signals:
- DM-RS (Demodulation reference signal); TS 38.211 clause 7.4.1.3

NR_BWP_PDCCH_Configuration_Type

TTCN-3 Record Type			
Name	**NR_BWP_PDCCH_Configuration_Type**		
Comment	PDCCH configuration at the SS for specific BWP; NOTE: There are no fields for PDCCH-Config's "downlinkPreemption", "slotFormatIndicator", "tpc-PUSCH" and "tpc-PUCCH": This information is related to triggering DCI formats 2_X an shall be configured there (NR_DCI_Trigger_Type) according to test case requirements		
SearchSpaceArray	NR_BWP_SearchSpaceList _Type	opt	
CoresetArray	NR_BWP_CoresetList_Typ e	opt	
RelativeTxPower	NR_PDCCH_EPREs_Type	opt	

NR_BWP_CoresetList_Type

TTCN-3 Record of Type	
Name	**NR_BWP_CoresetList_Type**
Comment	list of CORESETs defined for a single BWP; according to TS 38.213 clause 10.1 "The control resource set configured for Type0-PDCCH common search space has control resource set index 0" NOTE: even though in general (array) index and controlResourceSetId are the same it is not clear what is meant by TS 38.213
record of NR_ASN1_ControlResourceSet_Type	

NR_BWP_SearchSpaceList_Type

TTCN-3 Record of Type	
Name	**NR_BWP_SearchSpaceList_Type**
Comment	list of search spaces defined for a single BWP; according to TS 38.213 clause 10.1 "The Type0-PDCCH common search space has search space index 0" NOTE: even though in general (array) index and searchSpaceId are the same it is not clear what is meant by TS 38.213
record of NR_BWP_SearchSpaceConfig_Type	

NR_PDCCH_EPREs_Type

TTCN-3 Record Type			
Name	**NR_PDCCH_EPREs_Type**		
Comment	EPRE for PDCCH and related signals		
PdcchToCell	NR_EPRE_Ratio_Type	opt	transmit power relative to given cell power for resource elements (REs) being occupied by PDCCH
PdcchToDmrs	NR_EPRE_Ratio_Type	opt	DM-RS associated to PDCCH; further DMRS parameters are given by ASN.1 PDCCH-Config as signalled to the UE or by additional parameters of the initial BWP configuration

D.1.3.2.2.3.2.1   Search_Space_Configuration

Search_Space_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_SearchSpaceCandidatePriority_Type	UInt_Type	Priorities to be considered by the SS in order to choose the candidate of a search space not colliding with the candidate of some other search space; a value of 0 represents the highest priority, a value of 1 the second highest priority and so on. The SS shall consider search space priorities to find appropriate candidates for scheduling of DCIs in case of a) Overlapping search spaces: Depending on system configuration and slot number candidates of the different search spaces may be located in same (or overlapping) CCEs. Example: system information is automatically scheduled by the SS and UE specific data transmission requires scheduling of PDCCH for the same slot and symbols => candidates of the UE specific search space may collide with actual PDCCH of the common search space (system information). b) Within a search space if different search space types are mapped to the same search space configuration Rules to select appropriate search space candidates: 1. For each search space the SS selects the candidate with index m(search space, L) = 0 With - candidate index m(search space, L) := 0 .. M(search space, L) - 1; - M(search space, L): number of PDCCH candidates per CCE aggregation level for the given search space - L: CCE aggregation level (see TS 38.213 clause 10.1) 2. If there is an overlapping of the selected candidates, the SS - keeps the candidate of the search space with higher priority - increments m for the search space with lower priority; this is done until there is no overlapping anymore. In the following cases the SS shall raise an error: A) Collision of PDCCH candidates of search spaces with the same priority B) When an DL transmission or a single UL grant is scheduled with specific TimingInfo and after applying the above rules there is no search space candidate left anymore NOTE: For TimingInfo 'Now' there is no error as the transmission can be shifted to the next PDCCH occasion. In case of continuous UL grant configuration the SS shall not raise an error when a grant cannot be scheduled at a specific point in time but skip it (periodicity=1) or shift it to the next occasion (periodicity>1).

NR_SearchSpaceType_Type

TTCN-3 Enumerated Type	
Name	**NR_SearchSpaceType_Type**
Comment	types of search spaces according to TS 38.213 clause 10.1; NOTE 1: In principle there could be more than one instance for the same kind of search space; if this is ever needed, this enumerated shall be enhanced by introduction of a second entry for a particular type. NOTE 2: For the USS UL and DL are distinguised as they may need different priority in terms of scheduling of DCIs
cssType0	Type0-PDCCH common search space for scheduling of SIB1 (SI-RNTI); the SS shall scramble the DCI format's CRC with SI-RNTI; aggregation level and number of candidates correspond to TS 38.213 Table 10.1-1; For stand-alone options parameters of search space and associated CORESET need to be according to L1 parameters 'RMSI-PDCCH-Config' and 'RMSI-scs' (corresponding to MIB.pdcch-ConfigSIB1) and TS 38.213 clause 13
cssType0A	Type0A-PDCCH common search space for scheduling of other system information (SI-RNTI); the SS shall scramble the DCI format's CRC with SI-RNTI
cssType1	Type1-PDCCH common search space for scheduling of Msg2/4 of RACH procedure (RA-RNTI, TC-RNTI, C-RNTI); the SS shall scramble the DCI format's CRC with - RA-RNTI for Msg2 of the RACH procedure - TC-RNTI (temporary C-RNTI) as configured for Msg4 of the RACH procedure (NR_TempC_RNTI_Type in NR_RAR_Payload_Type) - C-RNTI as stored for the cell (NR_ActiveCellConfig_Type) in all other cases
cssType2	Type2-PDCCH common search space for scheduling of Paging messages (P-RNTI); the SS shall scramble the DCI format's CRC with P-RNTI
cssType3	Type3-PDCCH common search space for other purpose DCIs (INT-RNTI, SFI-RNTI, TPC-PUSCH-RNTI, TPC-PUCCH-RNTI, TPC-SRS-RNTI, C-RNTI, CS-RNTI(s)); the SS shall scramble the DCI format's CRC with the RNTI-value as according to the ASP triggering the DCI to be sent
ussDL	UE-specific search space (C-RNTI, CS-RNTI(s)); the SS shall scramble the DCI format's CRC with the C-RNTI value as stored for the cell (NR_CellConfigCommon_Type)
ussUL	UE-specific search space: as USS_DL but in general with lower priority to give DL assignments precedence over periodic UL grants

NR_SearchSpaceTypeAndPriority_Type

TTCN-3 Record Type		
Name	**NR_SearchSpaceTypeAndPriority_Type**	
Comment		
Type	NR_SearchSpaceType_Type	
CandidatePriority	NR_SearchSpaceCandidatePriority_Type	priority to be considered when candidates of a different or the same search space overlap the same CCEs

NR_SearchSpaceTypeAndPriorityList_Type

TTCN-3 Record of Type	
Name	**NR_SearchSpaceTypeAndPriorityList_Type**
Comment	
record of NR_SearchSpaceTypeAndPriority_Type	

NR_PDCCH_CCE_AggregationLevel_Type

TTCN-3 Enumerated Type	
Name	**NR_PDCCH_CCE_AggregationLevel_Type**
Comment	Aggregation level for a search space
AggregationLevel1	
AggregationLevel2	
AggregationLevel4	
AggregationLevel8	
AggregationLevel16	

NR_BWP_SearchSpaceConfig_Type

TTCN-3 Record Type			
Name	**NR_BWP_SearchSpaceConfig_Type**		
Comment	configuration of a single search space at the SS: The position of a particular search space candidate in frequency and time domain depends on configuration of the search space and its associated CORESET (see TS 38.213 clause 10.1): - Common or UE-specific search space - aggregation level L - number of candidates per aggregation level - PDCCH monitoring periodicity and offset - frequency domain resources - number of symbols (time domain) in addition in case of UE-specific search space: - C-RNTI (as configured for the active cell) - carrier indicator field value (in case of cross carrier scheduling) all fields are mandatory as modification of a single field may cause inconsistencies		
TypeAndPriorityList	NR_SearchSpaceTypeAndPriorityList_Type		list of search space types (according to TS 38.213 clause 10.1) to be mapped to the given search space configuration. NOTE 1: In general the lists of search space types for different search spaces shall be mutual exclusive; NOTE 2: TS 38.213 clause 10.1 could be read as if the different types of search spaces use distinct instances of search spaces; nevertheless RRC type definitions allow use of different types in one and the same search space
AggregationLevel	NR_PDCCH_CCE_AggregationLevel_Type		aggregation level to be applied for an actual PDCCH of the given search space
SearchSpaceConfigAtUE	NR_ASN1_SearchSpace_Type		search space configuration as sent to the UE; contains searchSpaceId and controlResourceSetId referring to the associated CORESET; furthermore the SS may need e.g. the number of candidates to detect error situations in context of candidate selection

D.1.3.2.2.3.2.2   Search_Space_DCI_Assignment

NR_BWP_Id_List_Type

TTCN-3 Record of Type	
Name	**NR_BWP_Id_List_Type**
Comment	
record of BWP_Id	

NR_AssignedBWPs_Type

TTCN-3 Record Type			
Name	**NR_AssignedBWPs_Type**		
Comment	definition of a set of BWPs being assigned e.g. to system information scheduling or RACH procedures NOTE 1: there is no error when e.g. "ActiveBWP" is set and the currently active BWP is contained in DedicatedBWPs too NOTE 2: it is up to use of this type in TTCN to ensure that a specific BWP assignment makes sense, in most cases multiple BWPs may not be applicable		
ActiveBWP	Null_Type	opt	SS shall assign the currently active BWP
InitialBWP	Null_Type	opt	SS shall assign the initial BWP
DedicatedBWPs	NR_BWP_Id_List_Type		SS shall assign all BWPs as listed (on top of active or initial BWP if set); an empty list indicates that no (additional) BWPs are assigned

NR_SearchSpaceDlDciAssignment_Type

TTCN-3 Record Type			
Name	**NR_SearchSpaceDlDciAssignment_Type**		
Comment	configuration of DCI for a specific search space; in general the configuration belongs to a transport channel configuration (e.g. BCH, PCH, DL-SCH): the DCI is applied for DL transmission on the respective channel and can be explicitly initiated by TTCN (e.g. PCH, DL-SCH) or automatically by the SS (e.g. BCH or Msg2/Msg4 scheduling of RACH procedure); all fields are mandatory for the first configuration of an instance for modifications "omit" means "keep as it is"		
AssignedBWPs	NR_AssignedBWPs_Type	opt	BWP where given DCI shall be scheduled in given search space; NOTE 1: When there is no BWP according to configuration of AssignedBWPs, there is no DL assignment; this can be used e.g. to prevent automatic scheduling of system information; NOTE 2: In principle a DL assignment can happen simultaneously in more than one BWP e.g. if system information shall be scheduled in active and initial BWP; but as long as there is no use case for simultaneous DL assignments, configuration of AssignedBWPs shall be restricted to a maximum of one BWP
SearchSpaceType	NR_SearchSpaceType_Type	opt	search space to be used for sending of given DCI; when at the scheduled point in time of a DL transmission there is no such search space configured at the given BWP, the SS may raise an error
DciInfo	NR_DciDlInfo_Type	opt	DCI to be used

NR_SearchSpaceUlDciAssignment_Type

TTCN-3 Record Type			
Name	**NR_SearchSpaceUlDciAssignment_Type**		
Comment	configuration of DCI for UL grants in the UL USS; in general the configuration belongs to a transport channel configuration (e.g. UL-SCH); all fields are mandatory for the first configuration of an instance for modifications "omit" means "keep as it is"		
AssignedBWPs	NR_AssignedBWPs_Type	opt	BWP where given DCI shall be scheduled in given search space; AssignedBWPs shall specify exactly one BWP (ActiveBWP in general); the SS may raise an error otherwise
SearchSpaceType	NR_SearchSpaceType_Type	opt	search space to be used for sending of given DCI; when at the scheduled point in time of a UL grant transmission there is no such search space configured at the given BWP, the SS may raise an error
DciInfo	NR_DciUlInfo_Type	opt	DCI to be used

D.1.3.2.2.3.3 CSI_Reference_Signals

NR_CSI_ResourceConfigList_Type

TTCN-3 Record of Type	
Name	**NR_CSI_ResourceConfigList_Type**
Comment	
record of NR_ASN1_CSI_ResourceConfig_Type	

NR_CSI_RS_ConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_CSI_RS_ConfigInfo_Type**		
Comment	Channel-state information reference signal (CSI) according to TS 38.211 clause 7.4.1.5; UE procedure for reporting channel state information as according to TS 38.214 clause 5.2		
ResourceConfigList	NR_CSI_ResourceConfigList_Type	opt	list of CSI resource configurations as signalled to the UE; CSI-ResourceConfig contains configuration of either nzp-CSI-RS-ResourceSets or csi-IM-ResourceSets with L1 parameters for the CSI reference signals according to TS 38.211 clause 7.4.1.5 (e.g. ScramblingID, CDM-Type, etc.)
RelativeTxPower	NR_EPRE_Ratio_Type	opt	transmit power for resource elements (REs) being used for CSI-RS

NR_CSI_RS_Config_Type

TTCN-3 Union Type		
Name	**NR_CSI_RS_Config_Type**	
Comment		
ConfigInfo	NR_CSI_RS_ConfigInfo_Type	configuration of CSI Reference Signals
None	Null_Type	no CSI Reference Signals

D.1.3.2.3 PhysicalLayer_Uplink

Uplink physical layer configuration: UL channels and BWPs

NR_CellConfigPhysicalLayerUplink_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayerUplink_Type**		
Comment	physical layer configuration at the SS for the uplink of a cell		
Uplink	NR_Uplink_Type	opt	
Supplementary Uplink	NR_Uplink_Type	opt	
TimingAdvance	NR_SS_TimingAdvanceConfig_Type	opt	
PUSCH_ServingCellConfig	NR_ASN1_PUSCH_ServingCellConfig_Type	opt	

NR_Uplink_Type

TTCN-3 Union Type		
Name	**NR_Uplink_Type**	
Comment		
Config	NR_UplinkConfig_Type	
None	Null_Type	in case the uplink or supplementary uplink is not used/needed

NR_SS_TimingAdvanceConfig_Type

TTCN-3 Union Type		
Name	**NR_SS_TimingAdvanceConfig_Type**	
Comment		
InitialValue	NR_RACH_TimingAdvance_Type	initial 12 bit value corresponding to Timing Advance Command field of the Random Access Response (TS 38.321 clause 6.2.3): value of 0..3846 according to TS 38.213 clause 4.2; 0 in normal cases)
Relative	NR_TimingAdvanceIndex_Type	timing advance command to adjust changes of timing advance acc. to TS 38.213 clause 4.2; (range acc. 6 bit value: -31..32)

D.1.3.2.3.1 Uplink_BWP

NR_UplinkBWP_Type

TTCN-3 Record Type			
Name	**NR_UplinkBWP_Type**		
Comment	Configuration of single BWP at the SS; NOTE: for rel-15 this is the same as the ASN.1 type "BWP-Uplink" but nevertheless the TTCN type may be useful for future extensions		
Id	BWP_Id	opt	Initial BWP: 0 Dedicated BWP: 1..4

Common	NR_ASN1_BWP_UplinkCommon_Type	opt	contains common configuration for RACH, PUSCH, PUCCH configuration at the UE:
			- Initial BWP:
			  -> ServingCellConfigCommon.uplinkConfigCommon.initialUplinkBWP
			
			ServingCellConfigCommon.supplementaryUplinkConfig.initialUplinkBWP
			  -> SIB1.uplinkConfigCommon.initialUplinkBWP
			
			SIB1.supplementaryUplink.uplinkConfigCommon.initialUplinkBWP
			- Dedicated BWP:
			  -> ServingCellConfig.uplinkConfig.uplinkBWP-ToAddModList[-].bwp-Common
			    ServingCellConfig.supplementaryUplink.uplinkBWP-ToAddModList[-].bwp-Common

Dedicated	NR_ASN1_BWP_UplinkDedicated_Type	opt	contains dedicated configuration for PUCCH, PUCCH, ConfiguredGrant, SRS, BeamFailureRecovery configuration at the UE:
			- Initial BWP:
			  -> ServingCellConfig.uplinkConfig.initialUplinkBWP
			    ServingCellConfig.supplementaryUplink.initialUplinkBWP
			- Dedicated BWP:
			  -> ServingCellConfig.uplinkConfig.uplinkBWP-ToAddModList[-].bwp-Dedicated
			    ServingCellConfig.supplementaryUplink.uplinkBWP-ToAddModList[-].bwp-Dedicated

NR_UplinkBWP_List_Type

TTCN-3 Record of Type	
Name	**NR_UplinkBWP_List_Type**
Comment	configuration of BWPs: each entry shall have a distinct Id with ID=0 for the initial BWP NOTE: Even though in general the BWP-Id corresponds to the index of the element within the array of BWPs, the SS shall not take this as assumption
record of NR_UplinkBWP_Type	

NR_ActiveUplinkBWP_Id_Type

TTCN-3 Union Type		
Name	**NR_ActiveUplinkBWP_Id_Type**	
Comment		
Explicit	BWP_Id	in case that BWP-Id of active UL-BWP (and/or active UL-BWP of supplementary UL) is different than BWP-Id of active DL-BWP
SameIdAsDL	Null_Type	same BWP-Id as of the active DL-BWP

NR_UplinkBWPs_Type

TTCN-3 Record Type			
Name	**NR_UplinkBWPs_Type**		
Comment	configuration of uplink BWPs		
ActiveBWP	NR_ActiveUplinkBWP_Id_Type	opt	Id of the currently active BWP (this does not need to be the same as the index)
BwpArray	NR_UplinkBWP_List_Type	opt	array of band width parts: initial BWP + up to 4 dedicated BWPs

NR_UplinkConfig_Type

TTCN-3 Record Type			
Name	**NR_UplinkConfig_Type**		
Comment	configuration of a single uplink (uplink or supplementary uplink)		
FrequencyInfoUL	NR_ASN1_FrequencyInfoUL_Type	opt	carries information about location of reference resource block (point A) in frequency domain and about associated frequency bands (list of FreqBandIndicatorNR) !!!! NR-NOTE: there is no configuration parameters anymore as for EUTRA's UplinkStaticCellInfo_Type.Earfcn and UplinkStaticCellInfo_Type.Bandwidth !!!!
BWPs	NR_UplinkBWPs_Type	opt	
RACH_ConfigDedicated	NR_ASN1_RACH_ConfigDedicated_Type	opt	configuration at the UE: -> SpCellConfig.reconfigurationWithSync.rach-ConfigDedicated.uplink/supplementaryUplink

D.1.3.2.4   DCI_Configuration

Definitions for resource assignment and DCI according to TS 38.212 clause 7.3 and TS 38.214 clause 5.1.2 and 6.1.2

D.1.3.2.4.1   Common_Fields

Common type definitions for DCI fields being used for UL and DL assignments (format 0_X and 1_X);
NOTE: in general fields of DCIs are defined as union in the first place to allow backward compatible enhancements,
e.g. when a dynamic SS behaviour needs to replace the static value assignment

NR_DciCommon_CarrierIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_CarrierIndicator_Type**	
Comment	Carrier indicator field (CIF) of DCI formats 0_1 and 1_1 according to TS 38.212 and TS 38.213 clause 10.1	
None	Null_Type	no cell index to be indicated in Carrier indicator field
CellIndex	B3_Type	3 bits cell index to be indicated in Carrier indicator field; applicable when the UE is configured with higher layer parameter CrossCarrierSchedulingConfig

NR_DciCommon_BWPIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_BWPIndicator_Type**	
Comment	Bandwidth part indicator according to TS 38.212 Table 7.3.1.1.2-1; used to address RRC-configured BandwidthPart-Config; NOTE: in general the BWP configuration at the SS is static i.e. dedicated BWPs may be preconfigured in a test case preamble => a) BWP configuration at the SS is not always the same as at the UE and SS cannot determine the number of BWPs being configured at the UE from its BWP configuration. b) The number and order of BWPs may differ at SS and UE. c) The index used in the DCI's BWP indicator is not identical with the BWP-Id as the BWP indicator is the index in the UE's BWP array => in general the SS cannot determine the size and value of the DCI's BWP indicator but this need to be done in TTCN	
Index	bitstring	0, 1 or 2 bits

NR_DciCommon_TpcCommand_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_TpcCommand_Type**	
Comment	TPC Command Field according to TS 38.213 Table 7.1.1-1 and Table 7.2.1-1	
Value	B2_Type	2 bits; default value: '01'B (0 dB; accumulated TPC)

NR_DciCommon_VrbPrbMapping_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_VrbPrbMapping_Type**	
Comment	to specify how VRB-to-PRB mapping shall be controlled by DCI if applicable (see TS 38.212 Table 7.3.1.1.2-33 and where it is referred)	
None	Null_Type	0 bit, applicable when only resource allocation type 0 is configured or for format 0_1 if PUSCH-tp=Enabled
Index	B1_Type	1 bit, index in TS 38.212 Table 7.3.1.1.2-33 indicating non-interleaved or interleaved VRB-to-PRB mapping according to TS 38.211 clause 6.3.1.7

NR_DciCommon_TimeDomainResourceAssignment_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_TimeDomainResourceAssignment_Type**	
Comment	Common type definition for UL/DL Resource allocation in time domain according to TS 38.214 clause 5.1.2.1 and 6.1.2.1	
Index	bitstring	index of entry in SEQUENCE OF PUSCH/PDSCH-TimeDomainResourceAllocation provided e.g. by PUSCH/PDSCH-Config; number of bits in a particular DCI depends on the size of the SEQUENCE OF PUSCH/PDSCH-TimeDomainResourceAllocation (e.g. Time domain resource assignment is an empty bitstring (''B) when only one time-domain configuration is provided to the UE) NOTE: PDSCH/PUSCH-Config overrules list in PDSCH/PUSCH-ConfigCommon

NR_DciFormat_X_1_SrsRrequest_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_X_1_SrsRrequest_Type**	
Comment	TS 38.212 clause 7.3.1.2: SRS request	
SingleUL	B2_Type	2 bits: Index of the SRS resource set to be used according to TS 38.212 Table 7.3.1.1.2-24
UL_SUL	B3_Type	3 bits: Index of the SRS resource set to be used according to TS 38.212 Table 7.3.1.1.2-24 plus first bit to distiguish UL/SUL

NR_DciFormat_X_1_DmrsSequenceInit_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_X_1_DmrsSequenceInit_Type**	
Comment	TS 38.212 clause 7.3.1.2 (format 0_1) and clause 7.3.2.2 (format 1_1): DMRS sequence initialization	
None	Null_Type	0 bit for format 0_1 and if PUSCH-tp==Enabled
Value	B1_Type	1 bit else

D.1.3.2.4.2   Resource_Allocation

Type definitions for resource allocation which do not correpond directly to DCI fields
but are used to configure how the SS maintains resource allocation for a given DCI

Resource_Allocation: Basic Type Definitions

TTCN-3 Basic Types		
NR_ImcsValue_Type	integer (0..31)	Modulation and coding scheme index coding
NR_RedundancyVersion_ Type	integer (0..3)	Redundancy Version (RV): 2 bits

NR_ResourceAllocationType_Type

TTCN-3 Enumerated Type		
Name	**NR_ResourceAllocationType_Type**	
Comment	to specify the format of the resource allocation type being used for frequency domain resource assignment in DCI; NOTE 1: For DCI Format 0_0 and 1_0 only resourceAllocationType1 is applicable (TS 38.214 clause 5.1.2.2 and 6.1.2.2) NOTE 2: The SS needs to determined based on RRC configuration whether MSB of the frequency domain resource assignment needs to used as discriminator for type 0/1 (see TS 38.212 clause 7.3.1.1.2 and clause 7.3.1.2.2 and PUSCH/PDSCH-Config.resourceAllocation) NOTE 3: THe SS shall raise an error if the DCI configuration conflicts with the configuration given by PUSCH/PDSCH-Config.resourceAllocation	
resourceAllocationType0	resource allocation type 0 according to TS 38.214 clause 5.1.2.2.1 and 6.1.2.2.1: bitmap indicating the Resource Block Groups (RBGs) that are allocated; not applicable for DCI Format 0_0 and 1_0	
resourceAllocationType1	resource allocation type 1 according to TS 38.214 clause 5.1.2.2.2 and 6.1.2.2.2: resource indication value (RIV) corresponding to a starting virtual resource block and a length in terms of contiguously allocated resource blocks	

NR_ModulationSchemePDSCH_Type

TTCN-3 Enumerated Type	
Name	**NR_ModulationSchemePDSCH_Type**
Comment	Supported modulation schemes for PDSCH according to 38.211 Table 7.3.1.2-1
qpsk	
qam16	
qam64	
qam256	

NR_FreqDomainSchedulExplicit_Type

TTCN-3 Record Type			
Name	**NR_FreqDomainSchedulExplicit_Type**		
Comment	type used for explicit DL scheduling; Nprb is the exact number of RBs whereas in NR_FreqDomainSchedulCommon_Type MaxRbCnt is the upper bound		
FirstRbIndex	integer		index of the first resource block in frequency domain
Nprb	integer		number of resource blocks to be assigned

NR_FreqDomainSchedulCommonDL_Type

TTCN-3 Record Type			
Name	**NR_FreqDomainSchedulCommonDL_Type**		
Comment	common type to specify restrictions for frequency domain scheduling by a start index and a maximum range of RBs (similar to EUTRA, but for NR in general the frequency domain scheduling is not related to the whole frequency band but to a given band width part (BWP)		
FirstRbIndex	integer		index of the first (vitual) resource block in frequency domain
MaxRbCnt	integer		maximum number of resource-blocks to be used for a transport block; SS shall not assigned more than the given resource blocks; FirstRbIndex + MaxRbCnt shall not exceed the total number of available resoource blocks in frequency domain; the SS shall raise an error otherwise

NR_FreqDomainResourceAssignmentDL_Type

TTCN-3 Union Type		
Name	**NR_FreqDomainResourceAssignmentDL_Type**	
Comment		
Automatic	NR_FreqDomainSchedulCommonDL_Type	The SS shall automatically do the resource assignment needed for a DL transmission based on TBS evaluation guideline given in Annex XX of 38.523-3 !!!! NR-TBD: reference to be added; NOTE: there seems to be no reason for a "TBS" excel sheet; !!!! the same information can be provided in word tables in an appropriate annex !!!!
Explicit	NR_FreqDomainSchedulExplicit_Type	Frequency domain resource assignment is given explicitly by TTCN; the SS needs to calculate the RIV (resource allocation type 1) or generate the bitmap (resource allocation type 0). In case of resource allocation type 0 the allocation shall also be in consecutive RBGs. NOTE: So far there is no requirement for signalling tests to use non-consecutive RBGs ((neither for LTE nor for NR)

NR_RedundancyVersionList_Type

TTCN-3 Record of Type	
Name	**NR_RedundancyVersionList_Type**
Comment	There shall be as many entries in the list as re-transmissions are allowed; if there are not enough elements specified SS shall raise an error; In 4G at least in UL the array length corresponds to maxHARQ-Tx (i.e. up to 28 re-transmissions according to RRC ASN.1)
record of NR_RedundancyVersion_Type	

NR_TransportBlockSchedulingDL_Automatic_Type

TTCN-3 Record Type			
Name	**NR_TransportBlockSchedulingDL_Automatic_Type**		
Comment			
TransportBlock 1	NR_ModulationSchemePDSCH_Type		
TransportBlock 2	NR_ModulationSchemePDSCH_Type	opt	MCS for 2nd transport block (if any); 'omit' means that there is no 2nd transport block; Presence corresponds to PDSCH-Config.maxNrofCodeWordsScheduledByDCI (L1 parameter Number-MCS-HARQ-DL-DCI)
RedundancyVersionList	NR_RedundancyVersionList_Type		list of Redundancy versions to be used for DL transmission and possible retransmissions; in automatic mode the same list of redundancy versions is used for both transport blocks; if there are not enough elements to achieve successful DL transmission, SS shall raise an error

NR_TransportBlockSingleTransmission_Type

TTCN-3 Record Type			
Name	**NR_TransportBlockSingleTransmission_Type**		
Comment	TS 38.212 clause 7.3.1.2.1 and 7.3.1.2.2: parameters for transmission (or re-transmission) of a single transport block; used for explicit mode of DL transmission; NOTE: There is no requirement to control the timing of potential re-tansmission (as for LTE re-transmissions shall be exceptional and result in an inconclusive verdict when not tolerable for a test case)		
ImcsValue	NR_ImcsValue_Type		Imcs value to be mapped to the Modulation and coding scheme field of DCI format 1_0 or 1_1
RedundancyVersion	NR_RedundancyVersion_Type		Redundancy version for a single transmission or re-transmission
ToggleNDI	boolean		"true" for transmission of a new transport block, "false" for a re-transmission; the NDI (New data indicator) itself is maintained by the SS and therefore not provided as configuration parameter

NR_TransportBlockRetransmissionList_Type

TTCN-3 Record of Type	
Name	**NR_TransportBlockRetransmissionList_Type**
Comment	list of (initial) transmission and potential retransmissions; used for explicit mode of DL transmission; in general the Imcs is the same for all (re-)transmissions and the NDI is not toggled
record of NR_TransportBlockSingleTransmission_Type	

NR_TransportBlockSchedulingDL_Explicit_Type

TTCN-3 Record Type			
Name	**NR_TransportBlockSchedulingDL_Explicit_Type**		
Comment			
TransportBlock 1	NR_TransportBlockRetransmissionList_Type		list of transmission and retransmissions for transport block 1
TransportBlock 2	NR_TransportBlockRetransmissionList_Type	opt	'omit' means that there is no 2nd transport block; Presence corresponds to PDSCH-Config.maxNrofCodeWordsScheduledByDCI (L1 parameter Number-MCS-HARQ-DL-DCI)

NR_TransportBlockSchedulingDL_Type

TTCN-3 Union Type		
Name	**NR_TransportBlockSchedulingDL_Type**	
Comment		
Automatic	NR_TransportBlockSchedulingDL_Automatic_Type	
Explicit	NR_TransportBlockSchedulingDL_Explicit_Type	

NR_HarqProcessConfig_Type

TTCN-3 Union Type		
Name	**NR_HarqProcessConfig_Type**	
Comment	HARQ processes to be used automatically for UL grants or DL assignments	
None	Null_Type	when there is no HARQ for the given DCI
AnyProcess	Null_Type	The SS may choose any process for scheduling of the UL/DL data transfer
SpecificSubset	NR_HarqProcessList_Type	only the HARQ processes of this list shall be used automatically, other processes are excluded from automatic assignments; nevertheless for DL any HARQ processes may be addressed explicitly by NR_DRB_DataPerSlot_DL_Type.HarqProcess

D.1.3.2.4.3 PDSCH_Scheduling

NR_DciDlInfo_Type

TTCN-3 Record Type			
Name	**NR_DciDlInfo_Type**		
Comment	scheduling for CCCH/DCCH/DTCH mapped to DL-SCH mapped to PDSCH; for all parameters: mandatory for initial configuration of an instance, omit means "keep as it is" afterwards; definition is applicable for DCI format 1_0 (C-RNTI, RA-RNTI, TC-RNTI) and DCI format 1_1 !!!! NR-SA-FFS: DCI format 1_0 with CRC scrambled by SI-RNTI, P-RNTI !!!!		
ResoureAssignment	NR_DciFormat_1_X_ResourceAssignment_Type	opt	resource assignment; to control setting of the following fields in DCI formats 1_0 and 1_1 (TS 38.212 clause 7.3.1.2.1 and 7.3.1.2.2): Frequency domain resource assignment Time domain resource assignment Modulation and coding scheme New data indicator Redundancy version HARQ process number
VrbPrbMapping	NR_DciCommon_VrbPrbMapping_Type	opt	VRB-to-PRB mapping
TpcCommandPucch	NR_DciCommon_TpcCommand_Type	opt	TPC command for scheduled PUCCH; to be set to 1 per default (0 dB; accumulated TPC)
PucchResourceIndicator	NR_DciFormat_1_X_PucchResourceIndicator_Type	opt	PUCCH resource indicator
PdschHarqTimingIndicator	NR_DciFormat_1_X_PdschHarqTimingIndicator_Type	opt	PDSCH-to-HARQ_feedback timing indicator
Format	NR_DciFormat_1_X_SpecificInfo_Type	opt	DCI format and DCI format specific parameters

NR_DciFormat_1_X_ResourceAssignment_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_X_ResourceAssignment_Type**		
Comment	Common definition to be used for resource scheduling in DL		
ResourceAllocationType	NR_ResourceAllocationType_Type	opt	resource allocation type to be used for the frequency domain resource asignment
FreqDomain	NR_FreqDomainResourceAssignmentDL_Type	opt	
TimeDomain	NR_DciCommon_TimeDomainResourceAssignment_Type	opt	
TransportBlockScheduling	NR_TransportBlockSchedulingDL_Type	opt	information about MCS and RV for one or two transport blocks
HarqProcessConfig	NR_HarqProcessConfig_Type	opt	configures which HARQ processes the SS may use; corresponds to "HARQ process number" in TS 38.212 clause 7.3.1.2.1 and 7.3.1.2.2

NR_DciFormat_1_X_SpecificInfo_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_X_SpecificInfo_Type**	
Comment		
Format_1_0	NR_DciFormat_1_0_SpecificInfo_Type	
Format_1_1	NR_DciFormat_1_1_SpecificInfo_Type	

NR_DciFormat_1_0_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_0_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.1: scheduling of PDSCH in one DL cell; default parameters according to TS 38.508-1 clause 4.3.6.1.2.1		
DAI	NR_DciFormat_1_0_DAI_Type	opt	downlink assignment index

NR_DciFormat_1_1_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_1_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.2: scheduling of PDSCH in one cell; default parameters according to TS 38.508-1 clause 4.3.6.1.2.2 For all fields: 'omit' means that the information shall not be contained in the DCI on PDCCH		
CarrierIndicator	NR_DciCommon_CarrierIndicator_Type	opt	Carrier indicator - CIF value for Cross Carrier Scheduling; 'None' otherwise
BWPIndicator	NR_DciCommon_BWPIndicator_Type	opt	Bandwidth part indicator
VrbPrbMapping	NR_DciCommon_VrbPrbMapping_Type	opt	Downlink assignment index -to-PRB mapping !!!! NR-CHECK: is this a typo in 38.212 ??? !!!!
PrbBundlingSizeIndicator	NR_DciFormat_1_1_PrbBundlingSizeIndicator_Type	opt	PRB bundling size indicator
RateMatchingIndicator	NR_DciFormat_1_1_RateMatchingIndicator_Type	opt	Rate matching indicator
ZP_CSI_RS_Trigger	NR_DciFormat_1_1_ZP_CSI_RS_Trigger_Type	opt	ZP CSI-RS trigger
DAI	NR_DciFormat_1_1_DAI_Type	opt	downlink assignment index
AntennaPorts	NR_DciFormat_1_1_AntennaPorts_Type	opt	Antenna port(s)
TCI	NR_DciFormat_1_1_TCI_Type	opt	Transmission configuration indication
SrsRrequest	NR_DciFormat_X_1_SrsRrequest_Type	opt	SRS request
CBGTI	NR_DciFormat_1_1_CBGTI_Type	opt	CBG transmission information (CBGTI)
CBGFI	NR_DciFormat_1_1_CBGFI_Type	opt	CBG flushing out information (CBGFI)
DmrsSequenceInit	NR_DciFormat_X_1_DmrsSequenceInit_Type	opt	DMRS sequence initialization

NR_DciFormat_1_X_PucchResourceIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_X_PucchResourceIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.1/2: PUCCH resource indicator	
Value	B3_Type	3 bits as defined in TS 38.213 clause 9.2.3 or reserved bits; corresponds to L1 parameter PUCCH-Resource-Set (-> index to list of PUCCH-ResourceSet configured by PUCCH-Config

NR_DciFormat_1_X_PdschHarqTimingIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_X_PdschHarqTimingIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.1/2: PDSCH-to-HARQ_feedback timing indicator	
Value	B3_Type	3 bits as defined in TS 38.213 clause 9.2.3 or reserved bits; Format 1_1: corresponds to L1 parameter DL-data-DL-acknowledgement (seems to correspond to PUCCH-Config.dl-DataToUL-ACK) Format 1_0: addresses one of {1, 2, 3, 4, 5, 6, 7, 8}

NR_DciFormat_1_0_DAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_0_DAI_Type**	
Comment	TS 38.212 clause 7.3.2.1: DAI (downlink assignment indicator)	
Index	B2_Type	2 bits according to TS 38.213 clause 9.1.3 or reserved bits

NR_DciFormat_1_1_PrbBundlingSizeIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_PrbBundlingSizeIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.2: PRB bundling size indicator	
None	Null_Type	no PRB bundling
Dynamic	B1_Type	L1 parameter PRB_bundling is set to 'dynamic' (PRB_bundling corresponds to PDSCH-Config.prb-BundlingType); indicates which set of PRG values to be used (see 38.214 clause 5.1.2.3)

NR_DciFormat_1_1_RateMatchingIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_RateMatchingIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.2: Rate matching indicator; L1 parameter rate-match-PDSCH-resource-set coresponds to list of RateMatchPattern configured by PDSCH-Config	
Index	bitstring	0, 1, or 2 bits: Index in list of RateMatchPattern as configured by PDSCH-Config at the UE

NR_DciFormat_1_1_ZP_CSI_RS_Trigger_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_ZP_CSI_RS_Trigger_Type**	
Comment	TS 38.212 clause 7.3.2.2: ZP CSI-RS trigger; L1 parameter ZP-CSI-RS-ResourceConfigList coresponds to list of ZP-CSI-RS-Resource configured by PDSCH-Config	
Index	bitstring	0, 1, or 2 bits: Index in list of ZP-CSI-RS-Resource as configured by PDSCH-Config at the UE

NR_DciFormat_1_1_DAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_DAI_Type**	
Comment	TS 38.212 clause 7.3.2.2: DAI (downlink assignment indicator) depending on L1 parameter HARQ-ACK-codebook and the number of serving cells (HARQ-ACK-codebook seems to correspond to PhysicalCellGroupConfig.pdsch-HARQ-ACK-Codebook)	
None	Null_Type	no DAI
SingleServingCell	B2_Type	HARQ-ACK-codebook=dynamic and only one serving cell
MultipleServingCells	B4_Type	HARQ-ACK-codebook=dynamic and more than one serving cell

NR_DciFormat_1_1_AntennaPorts_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_AntennaPorts_Type**	
Comment	TS 38.212 clause 7.3.1.2: Antenna ports as defined by Tables TS 38.212 7.3.1.2.2-1..4	
Index	bitstring	bitstring presentation of index to Tables 7.3.1.2.2-1..4

NR_DciFormat_1_1_TCI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_TCI_Type**	
Comment	TS 38.212 clause 7.3.1.2: Transmission configuration indication (TCI)	
None	Null_Type	if L1 parameter TCI-PresentInDCI (corresponding to ControlResourceSet.tci-PresentInDCI) does not indicate 'enabled'
Value	B3_Type	if TCI-PresentInDCI=='enabled': TCI according to TS 38.213 clause 5.1.5/6

NR_DciFormat_1_1_CBGTI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_CBGTI_Type**	
Comment	TS 38.212 clause 7.3.1.2: CBG transmission information (CBGTI)	
Bitmap	bitstring	0, 2, 4, 6, or 8 bits according to PDSCH-CodeBlockGroupTransmission.maxCodeBlockGroupsPerTransportBlock and TS 38.214 clause 5.1.7.2

NR_DciFormat_1_1_CBGFI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_CBGFI_Type**	
Comment	TS 38.212 clause 7.3.1.2: CBG flushing out information (CBGFI)	
None	Null_Type	no CBGFI
Flag	B1_Type	CBGFI flag, if codeBlockGroupTransmission is configured in PDSCH-ServingCellConfig with codeBlockGroupFlushIndicator set to true

D.1.3.2.4.4 PUSCH_Scheduling

NR_DciUlInfo_Type

TTCN-3 Record Type			
Name	**NR_DciUlInfo_Type**		
Comment	scheduling for CCCH/DCCH/DTCH mapped to UL-SCH mapped to PUSCH; for all parameters: mandatory for initial configuration of an instance, omit means "keep as it is" afterwards		
ResoureAssignment	NR_DciFormat_0_X_ResourceAssignment_Type	opt	resource assignment; to control setting of the following fields in DCI formats 0_0 and 0_1 (TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2): Frequency domain resource assignment Time domain resource assignment Modulation and coding scheme New data indicator Redundancy version HARQ process number
PuschHoppingCtrl	NR_DciFormat_0_X_PuschHoppingCtrl_Type	opt	control of frequency hopping in DCI formats 0_0 and 0_1 (TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2)
TpcCommandPusch	NR_DciCommon_TpcCommand_Type	opt	TPC command for scheduled PUSCH; to be set to 1 per default (0 dB; accumulated TPC)
UL_SUL_Indicator	NR_DciFormat_0_X_UL_SUL_Indicator_Type	opt	to control use of supplementary UL by DCI
Format	NR_DciFormat_0_X_SpecificInfo_Type	opt	DCI format and DCI format specific parameters

NR_DciFormat_0_X_ResourceAssignment_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_0_X_ResourceAssignment_Type**		
Comment	Common definition to be used for resource scheduling in UL		
ResourceAllocationType	NR_ResourceAllocationType_Type	opt	resource allocation type to be used for the frequency domain resource asignment
FreqDomain	NR_FreqDomainSchedulExplicit_Type	opt	explicit resource assignment: first RB, number of RBs; corresponds to "Frequency domain resource assignment" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2
TimeDomain	NR_DciCommon_TimeDomainResourceAssignment_Type	opt	corresponds to "Time domain resource assignment" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2
TransportBlockScheduling	NR_TransportBlockRetransmissionList_Type	opt	information about MCS and RV for transport block transmission and possible re-transmissions; corresponds to "Modulation and coding scheme", "New data indicator" and "Redundancy version" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2
HarqProcessConfig	NR_HarqProcessConfig_Type	opt	HARQ process to be used for the scheduled UL data transfer corresponds to "HARQ process number" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2; NOTE: for 5G there is no synchronous HARQ anymore but HARQ is asynchroneous even for UL (TS 38.300 clause 5.3.5.4; TS 38.212 clause 7.3.1: 4-bit HARQ process number included in all DCI Formats for UL)

NR_DciFormat_0_X_SpecificInfo_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_X_SpecificInfo_Type**	
Comment		
Format_0_0	NR_DciFormat_0_0_SpecificInfo_Type	
Format_0_1	NR_DciFormat_0_1_SpecificInfo_Type	

NR_DciFormat_0_0_SpecificInfo_Type

TTCN-3 Record Type	
Name	**NR_DciFormat_0_0_SpecificInfo_Type**
Comment	TS 38.212 clause 7.3.1.1: scheduling of PUSCH in one cell; default parameters according to TS 38.508-1 clause 4.3.6.1.1.1

NR_DciFormat_0_1_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_0_1_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.1.2: scheduling of PUSCH in one cell; default parameters according to TS 38.508-1 clause 4.3.6.1.1.2; for all parameters: mandatory for initial configuration of an instance, omit means "keep as it is" afterwards		
CarrierIndicator	NR_DciCommon_CarrierIndicator_Type	opt	Carrier indicator - CIF value for Cross Carrier Scheduling; 'None' otherwise
BWPIndicator	NR_DciCommon_BWPIndicator_Type	opt	Bandwidth part indicator
VrbPrbMapping	NR_DciCommon_VrbPrbMapping_Type	opt	VRB-to-PRB mapping
FirstDAI	NR_DciFormat_0_1_FirstDAI_Type	opt	1st downlink assignment index
SecondDAI	NR_DciFormat_0_1_SecondDAI_Type	opt	2nd downlink assignment index
SrsResourceIndicator	NR_DciFormat_0_1_SrsResourceIndicator_Type	opt	SRS resource indicator
PrecodingInfo	NR_DciFormat_0_1_PrecodingInfo_Type	opt	Precoding information and number of layers
AntennaPorts	NR_DciFormat_0_1_AntennaPorts_Type	opt	Antenna ports
SrsRrequest	NR_DciFormat_X_1_SrsRrequest_Type	opt	SRS request
CsiRrequest	NR_DciFormat_0_1_CsiRrequest_Type	opt	CSI request
CBGTI	NR_DciFormat_0_1_CBGTI_Type	opt	CBG transmission information (CBGTI)
PtrsDmrsAssociation	NR_DciFormat_0_1_PtrsDmrsAssociation_Type	opt	PTRS-DMRS association
BetaOffsetIndicator	NR_DciFormat_0_1_BetaOffsetIndicator_Type	opt	beta_offset indicator
DmrsSequenceInit	NR_DciFormat_X_1_DmrsSequenceInit_Type	opt	DMRS sequence initialization

NR_DciFormat_0_X_PuschHoppingCtrl_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_X_PuschHoppingCtrl_Type**	
Comment	TS 38.212 7.3.1.1.1 (format 0_0) and 7.3.1.1.2 (format 0_1)	
None	Null_Type	0 bit if only resource allocation type 0 is configured
Flag	B1_Type	1 bit if only resource allocation type 1 is configured (or type 0 and type 1) '1'B to indicate frequency hopping according to TS 38.214 clause 6.3

NR_DciFormat_0_X_UL_SUL_Indicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_X_UL_SUL_Indicator_Type**	
Comment	TS 38.212 clause 7.3.1.1/2: UL/SUL indicator	
None	Null_Type	to be used when no SUL is configured
Value	bitstring	UL/SUL indicator according to TS 38.212 Table 7.3.1.1.1-1

NR_DciFormat_0_1_FirstDAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_FirstDAI_Type**	
Comment	TS 38.212 clause 7.3.1.2: First DAI (downlink assignment indicator) depending on L1 parameter HARQ-ACK-codebook (HARQ-ACK-codebook seems to correspond to PhysicalCellGroupConfig.pdsch-HARQ-ACK-Codebook)	
SemiStaticCodebook	B1_Type	1 bit according to TS 38.213 clause 9.1.2.2 for Type-1 HARQ-ACK (HARQ-ACK-codebook=semi-static)
DynamicCodebook	B2_Type	2 bits according to TS 38.213 Table 9.1.3-2 for Type-2 HARQ-ACK (HARQ-ACK-codebook=dynamic)

NR_DciFormat_0_1_SecondDAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_SecondDAI_Type**	
Comment	TS 38.212 clause 7.3.1.2: Second DAI (downlink assignment indicator) depending on L1 parameter HARQ-ACK-codebook (HARQ-ACK-codebook seems to correspond to PhysicalCellGroupConfig.pdsch-HARQ-ACK-Codebook)	
None	Null_Type	no 2nd DAI
DynamicCodebook	B2_Type	2 bits according to TS 38.213 Table 9.1.3-2 for Type-2 HARQ-ACK (HARQ-ACK-codebook=dynamic)

NR_DciFormat_0_1_SrsResourceIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_SrsResourceIndicator_Type**	
Comment	TS 38.212 clause 7.3.1.2: SRS resource indicator depending on L1 parameter SRS-SetUse (corresping to SRS-ResourceSet.usage)	
NonCodeBook	bitstring	SRS-SetUse==NonCodeBook: bitstring of index according to TS 38.212 Tables 7.3.1.1.2-28/29/30/31
CodeBook	bitstring	SRS-SetUse==CodeBook: bitstring of index according to TS 38.212 Table 7.3.1.1.2-32

NR_DciFormat_0_1_PrecodingInfo_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_PrecodingInfo_Type**	
Comment	TS 38.212 clause 7.3.1.2: Precoding information and number of layers depending on L1 parameter ulTxConfig (coresping to PUSCH-Config.txConfig)	
NonCodeBook	Null_Type	ulTxConfig==NonCodeBook: 0 bits
CodeBook	bitstring	ulTxConfig==CodeBook: bitstring according to TS 38.212 Tables 7.3.1.1.2-2..5; empty string for one antenna port only

NR_DciFormat_0_1_AntennaPorts_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_AntennaPorts_Type**	
Comment	TS 38.212 clause 7.3.1.2: Antenna ports depending (mainly) on - PUSCH-tp (PUSCH-Config.transformPrecoder), - UL-DMRS-config-type (DMRS-UplinkConfig.dmrs-Type), - UL-DMRS-max-len (DMRS-UplinkConfig.maxLength)	
Index	bitstring	bitstring presentation of index to Tables 7.3.1.1.2-6..23

NR_DciFormat_0_1_CsiRrequest_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_CsiRrequest_Type**	
Comment	TS 38.212 clause 7.3.1.2: CSI request	
Index	bitstring	0, 1, 2, 3, 4, 5, or 6 bits determined by L1 parameter ReportTriggerSize (CSI-MeasConfig.reportTriggerSize; TS 38.214 clause 5.2.1.5.1)

NR_DciFormat_0_1_CBGTI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_CBGTI_Type**	
Comment	TS 38.212 clause 7.3.1.2: CBG transmission information (CBGTI)	
Index	bitstring	0, 2, 4, 6, or 8 bits determined by L1 parameter maxCodeBlockGroupsPerTransportBlock corresponding to PUSCH-ServingCellConfig.codeBlockGroupTransmission.maxCodeBlockGroupsPerTransportBlock

NR_DciFormat_0_1_PtrsDmrsAssociation_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_PtrsDmrsAssociation_Type**	
Comment	TS 38.212 clause 7.3.1.2: PTRS-DMRS association	
None	Null_Type	0 bit if UL-PTRS-present=OFF and PUSCH-tp=Disabled, or if PUSCH-tp=Enabled
Value	B2_Type	2 bits according to TS 38.212 Table 7.3.1.1.2-25 and 7.3.1.1.2-26

NR_DciFormat_0_1_BetaOffsetIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_BetaOffsetIndicator_Type**	
Comment	TS 38.212 clause 7.3.1.2: beta_offset indicator	
None	Null_Type	0 bit if uci-on-PUSCH != dynamic (ConfiguredGrantConfig.uci-OnPUSCH
Value	B2_Type	2 bits according to TS 38.213 Table 9.3-3

D.1.3.3   MAC_Layer

Configuration for MAC procedures according to TS 38.321 clause 5 and related physical layer configuration

D.1.3.3.1   MAC_Layer_Common

MAC_Layer_Common: Basic Type Definitions

TTCN-3 Basic Types		
NR_TimingAdvanceIndex_Type	integer (0..63)	acc. to TS 38.321, clause 6.1.3.4 "Timing Advance Command MAC CE" and TS 38.213 clause 4.2 "Transmission timing adjustments"
NR_TimingAdvance_Period_Type	integer (400, 600, 1020, 1530, 2040, 4090, 8190)	the values correspond to 80 % of TimeAlignmentTimer (acc. to TS 38.523-3, clause 6.3.2): ms500, ms750, ms1280, ms1920, ms2560, ms5120, ms10240 rounded to nearest multiple of 10

NR_UplinkTimeAlignment_AutoSynch_Type

TTCN-3 Record Type			
Name	**NR_UplinkTimeAlignment_AutoSynch_Type**		
Comment	Parameters for automatic synchronisation of UL time alignment; The SS shall periodically transmit TA MAC control elements according to 38.321 clause 6.1.3.4 with - TAG-Id=0 for the SpCell - TAG-Id as configured for an SCell the transmission shall be continuously until being stopped		
TimingAdvance	NR_TimingAdvanceIndex_Type		amount of timing adjustment that MAC entity has to apply
TA_Period	NR_TimingAdvance_Period_Type		time period after which TA MAC control elements need to be automatically transmitted

NR_UplinkTimeAlignment_Synch_Type

TTCN-3 Union Type		
Name	**NR_UplinkTimeAlignment_Synch_Type**	
Comment	Configuration of Time Alignment of the UL	
None	Null_Type	no PUCCH Synchronisation applied
Auto	NR_UplinkTimeAlignment_AutoSynch_Type	SS automatically maintains PUCCH synchronization at UE

D.1.3.3.2   Random_Access_Procedure

NR_RachProcedureConfig_Type

TTCN-3 Record Type			
Name	**NR_RachProcedureConfig_Type**		
Comment	parameters to control the random access procedure; TS 38.321, clause 5.1; NOTE: RACH-ConfigCommon and RACH-ConfigDedicated are contained in NR_UplinkBWP_Type already (RACH-ConfigCommon as part of BWP-UplinkCommon		
RachProcedureList	NR_RachProcedureList_Type	opt	in normal cases there is one element which is used for any RA procedure

NR_RachProcedureList_Type

TTCN-3 Record of Type	
Name	**NR_RachProcedureList_Type**
Comment	to simulate RACH procedure with one or more than one attempt by the UE: There is one element in the list per PRACH Preamble attempt
record of NR_RachProcedure_Type	

NR_RachProcedure_Type

TTCN-3 Record Type			
Name	**NR_RachProcedure_Type**		
Comment			
RandomAccess Response	NR_RandomAccessRespon seConfig_Type	opt	configures how the SS shall react on a PRACH Preamble attempt, in general: - RAR with RAPID matching the RAPID of the UE's PRACH Preamble - RAR with RAPID not matching the RAPID of the UE's PRACH Preamble - BackoffIndicator - no response at all
ContentionRes olution	NR_ContentionResolutionC trl_Type	opt	Random Access Procedure may be 1. Contention free (Non-contention based) => no contention resolution 2. Contention based (see TS 38.321 clause 5.1.5): 2a) C-RNTI based: Msg3 contains MAC C-RNTI control element and in general contention resolution is done by assignment of an UL grant for this C-RNTI 2b) UE Contention Resolution Identity based: Msg3 contains RRC message to setup or restore RRC connection => contention resolution is done by sending of Msg4 with UE Contention Resolution Identity MAC CE

D.1.3.3.2.1   Random_Access_Response

Random_Access_Response: Basic Type Definitions

TTCN-3 Basic Types		
NR_RACH_TimingAdvanc e_Type	integer (0..3846)	12 bit value corresponding to Timing Advance Command field of the Random Access Response (TS 38.321 clause 6.2.3): 0..3846 according to TS 38.213 clause 4.2)
NR_RAR_BackoffIndicato r_Type	integer (0..15)	MAC subPDU for Backoff Indicator only according to TS 38.321 clause 6.1.5

NR_RAR_UplinkGrant_Type

TTCN-3 Record Type			
Name	**NR_RAR_UplinkGrant_Type**		
Comment	TS 38.213 Table 8.2-1; 25 bits according to TS 38.321 Figure 6.2.3-1 !!!! NR-NOTE: in TS 38.213 Table 8.2-1 there are 3 reserved bits at the end of the table what does not fit to TS 38.321 Figure 6.2.3-1 !!!!		
HoppingFlag	B1_Type		Hopping flag
Msg3Frequenc yResourceAlloc ation	B12_Type		Msg3 PUSCH frequency resource allocation
Msg3TimeReso urceAllocation	B4_Type		Msg3 PUSCH time resource allocation
MCS	B4_Type		Modulation and Coding Scheme: first sixteen indices of the applicable MCS index table for PUSCH (TS 38.214 Table 6.1.4.1-1)
TPC_Comman d	B3_Type		TPC command for Msg3 PUSCH
CQI_Req	B1_Type		CQI request

NR_TempC_RNTI_Type

TTCN-3 Union Type		
Name	**NR_TempC_RNTI_Type**	
Comment		
SameAsC_RNTI	Null_Type	in the RA response SS shall use the same C-RNTI as configured in NR_CellConfigCommon_Type; this is useful for initial random access
Explicit	RNTI_Value_Type	in the RA response SS shall use different value as configured in NR_CellConfigCommon_Type; this can be used when the UE already is in RRC_CONNECTED to have a temporary C-RNTI different from the one used by the UE; NOTE: when the UE is not in RRC_CONNECTED there shall be no explicit temp. C-RNTI since then the UE would assume this value as C-RNTI

NR_RAR_Payload_Type

TTCN-3 Record Type			
Name	**NR_RAR_Payload_Type**		
Comment	MAC payload for Random Access Response according to TS 38.321 clause 6.2.3		
TimingAdvance	NR_RACH_TimingAdvance_Type		timing advance: TS 38.321 clause 6.2.3 and TS 38.213 clause 4.2 NOTE: timing advance has impact not only on the RA procedure; SS in general needs to adjust its timing accordingly
UplinkGrant	NR_RAR_UplinkGrant_Type		initial UL grant
TempC_RNTI	NR_TempC_RNTI_Type		NOTE: In general for initial Random Access Procedure TempC_RNTI shall be 'SameAsC_RNTI' For Random Access Procedure in RRC_CONNECTED state the NW assigns a temporary C-RNTI which is replaced by the one stored at the UE; => TempC_RNTI may be 'SameAsC_RNTI' (in this case temp. C-RNTI and C-RNTI are equal what is not likely in a real network), or there is an explicit temp. C-RNTI what is used during RA procedure only (as in a real network)

NR_RAR_RapIdOnly_Type

TTCN-3 Record Type			
Name	**NR_RAR_RapIdOnly_Type**		
Comment	MAC subPDU for RAPID only (acknowledgment for SI request) according to TS 38.321 clause 6.1.5		
RapId	RAR_RapIdCtrl_Type		

NR_RAR_RapIdAndPayload_Type

TTCN-3 Record Type			
Name	**NR_RAR_RapIdAndPayload_Type**		
Comment	MAC subPDU for RAPID and RAR payload according to TS 38.321 clause 6.1.5		
RapId	RAR_RapIdCtrl_Type		
Payload	NR_RAR_Payload_Type		

NR_RAR_SubPdu_Type

TTCN-3 Union Type		
Name	**NR_RAR_SubPdu_Type**	
Comment	Random Access Response sub-PDU according to TS 38.321 clause 6.1.5	
BackoffIndicator	NR_RAR_BackoffIndicator_Type	
RapIdOnly	NR_RAR_RapIdOnly_Type	
RapIdAndPayload	NR_RAR_RapIdAndPayload_Type	

NR_RAR_SubPduList_Type

TTCN-3 Record of Type	
Name	**NR_RAR_SubPduList_Type**
Comment	list of MAC subPDUs; if a Backoff Indicator is included it has to be the first element (TS 38.321 clause 6.1.5)
record of NR_RAR_SubPdu_Type	

NR_RAR_MacPdu_Type

TTCN-3 Record Type			
Name	**NR_RAR_MacPdu_Type**		
Comment			
SubPduList	NR_RAR_SubPduList_Type	opt	list of Backoff Indicator (optional) and random access responses; empty list if no RAR shall be sent at all (omit means "keep as it is" as usual)
CrcError	boolean	opt	if set, MAC PDU shall transmitted with CRC bits (0-3) being toggled

NR_RandomAccessResponseConfig_Type

TTCN-3 Record Type			
Name	**NR_RandomAccessResponseConfig_Type**		
Comment	configuration for Random Access Response mapped to DL-SCH mapped to PDSCH		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general a RACH procedure is expected at the BWP currently being configured as active BWP at the SS; Type1-PDCCH common search space is used for scheduling of the Random Access Response (Msg2)
MacPdu	NR_RAR_MacPdu_Type	opt	MAC PDU to be sent automatically by the SS when there has been a RACH preamble

D.1.3.3.2.2 Contention_Resolution

NR_ContentionResolutionCtrl_Type

TTCN-3 Union Type		
Name	**NR_ContentionResolutionCtrl_Type**	
Comment		
None	Null_Type	no contention resolution: e.g. in case of contention free random access procedure or for special cases of contention based random access procedure
CRNTI_Based	NR_SearchSpaceUlDciAssignment_Type	contention resolution based on C-RNTI on PDCCH: The SS assigns UL grant on PDCCH; in general the UL grant is scheduled in the Type1-PDCCH common search space of the BWP currently being configured as active BWP at the SS => in general UL grant shall be configured as "Format_0_0"
Msg4_Based	NR_RachProcedureMsg4_Type	contention resolution based on UE Contention Resolution Identity on DL-SCH

NR_RachProcedureMsg4_Type

TTCN-3 Record Type			
Name	**NR_RachProcedureMsg4_Type**		
Comment	Msg4 of the RACH procedure in case of contention resolution based on UE Contention Resolution Identity		
ContentionResolutionId	NR_ContentionResolutionId_Type		Contention Resolution Id contained in MAC PDU of Msg4
RrcPdu	NR_RachProcedureMsg4RrcMsg_Type		RRC message to be contained in Msg4 of the RACH procedure
CrcError	boolean		if set, MAC PDU shall transmitted with CRC bits (0-3) being toggled

NR_ContentionResolutionId_Type

TTCN-3 Union Type			
Name	**NR_ContentionResolutionId_Type**		
Comment			
XorMask	B48_Type		When SS receives Contention Resolution ID from the UE, SS shall XOR it with the given mask and use this as Contention Resolution ID; this allows to get an unmatching Contention Resolution ID; in normal cases mask shall be set to tsc_ContentionResolutionId_Unchanged (i.e. the Contention Resolution ID remains unchanged)
None	Null_Type		MAC Contention Resolution Control Element is not contained in the MAC PDU sent out as response for Msg3

NR_RachProcedureMsg4RrcMsg_Type

TTCN-3 Union Type			
Name	**NR_RachProcedureMsg4RrcMsg_Type**		
Comment			
RrcCcchMsg	octetstring		encoded RRC message for CCCH; LCID=000000 for CCCH
RrcDcchMsg	octetstring		encoded RRC message for DCCH; the SS shall - apply integrity protection, - add a PDCP header accordingly, - add an AM RLC header, - use LCID=000001 corresponding to SRB1 as logical channel id
None	Null_Type		Msg4 does not contain any RRC message, e.g. when RRC message is sent stand-alone in separate DL transmission

D.1.3.4   System_Information_Control

Primitive to configuration scheduling of system information on BCCH/BCH

System_Information_Control: Basic Type Definitions

TTCN-3 Basic Types		
NR_BcchToPbchConfig_Type	Null_Type	place holder for BCCH mapped to BCH mapped to PBCH: MIB using fixed periodicity (80ms) and repetitions (80ms) according to TS 38.331 clause 5.2.1; the position of SS/PBCH blocks in frequency and time domain is specified in TS 38.211 clause 7.4.3 and TS 38.213 clause 4.1 the SS configuration for SS/PBCH blocks is defined by NR_SSB_Config_Type as part of physical layer configuration of a cell
NR_SiWindowLength_Type	integer	!!!! NR-SA-TBD: to be replaced by appropriate ASN.1 type definition !!!!

NR_Sib1Schedul_Type

TTCN-3 Record Type			
Name	NR_Sib1Schedul_Type		
Comment	Scheduling of SIB1 (RMSI - Remaining Minimum SI, according to TS 38.300 clause 7.3): fixed scheduling in time domain according to TS 38.331 clause 5.2.1 (periodicity: XXms; repetitions every XXms !!!! NR_SA_TBD: periodicity, repetitions !!!!)		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general SIB scheduling is assigned to the initial BWP's Type0-PDCCH common search space; in principle SIB scheduling can be configured to happen simultaneously in more than one BWP (e.g. initial BWP and active BWP); SIB1 scheduling may be stopped by not assigning any BWP (AssignedBWPs being empty)

NR_SingleSiSchedul_Type

TTCN-3 Record Type			
Name	NR_SingleSiSchedul_Type		
Comment	Scheduling for a single SI in its SI-window within a BWP (or even within several BWPs)		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general SIB scheduling is assigned to the initial BWP's Type0A-PDCCH common search space; nevertheless in principle scheduling can be configured to happen simultaneously in more than one BWP (e.g. initial BWP and active BWP)
TimeDomainOffset	integer	opt	!!!! NR-SA-TBD: to be specified which kind of offset to be applied (e.g. slots, subframes etc.); !!!! NOTE: timing is partly defined by search space configuration already !!!!

NR_OtherSiSchedul_Type

TTCN-3 Record Type			
Name	NR_OtherSiSchedul_Type		
Comment	Scheduling of other SI ("other SI" according to TS 38.300 clause 7.3): specifies for a specific SI the scheduling and repetitions within its SI window		
Periodicity	integer	opt	!!!! NR-SA-TBD: to be checked; type to be replaced according to ASN.1 !!!!
Window	record of NR_SingleSiSchedul_Type	opt	!!!! NR-SA-TBD: to be checked; taken over from EUTRA as initial draft; appropriate comments to be added (see EUTRA) !!!!

NR_AllOtherSiSchedul_Type

TTCN-3 Record Type			
Name	NR_AllOtherSiSchedul_Type		
Comment	Scheduling of (all) other SI (i.e. SIB2 and above according to TS 38.300 clause 7.3)		
WindowLength	NR_SiWindowLength_Type	opt	to calculate start of each SI window according to TS 38.331 clause !!!! NR-SA-TBD: core spec reference to be added !!!!
SiList	NR_OtherSiSchedul_Type	opt	list of scheduling info for the SIs containing one ore more SIBs
SegmentedSiList	NR_OtherSiSchedul_Type	opt	!!!! NR-SA-TBD: check whether this is needed; appropriate comments to be added if so !!!!

NR_BcchToPdschConfig_Type

TTCN-3 Record Type			
Name	NR_BcchToPdschConfig_Type		
Comment	configuration for BCCH mapped to DL-SCH mapped to PDSCH		
Sib1Schedul	NR_Sib1Schedul_Type	opt	SIB1 scheduling
SiSchedul	NR_AllOtherSiSchedul_Type	opt	scheduling of other SI

BCCH_DL_SCH_Message

TTCN-3 Record Type	
Name	**BCCH_DL_SCH_Message**
Comment	!!!! NR-SA-TBD: to be removed when there is an ASN.1 type definition !!!!

NR_SI_List_Type

TTCN-3 Record of Type	
Name	**NR_SI_List_Type**
Comment	list of system information messages
record of BCCH_DL_SCH_Message	

NR_SegmentedSI_List_Type

TTCN-3 Record of Type	
Name	**NR_SegmentedSI_List_Type**
Comment	Each element is a list of segments; used for segmented SIBs !!!! NR-SA-TBD: to be added which ones (SIB11/12 for EUTRA) !!!!
record of NR_SI_List_Type	

NR_BcchInfo_Type

TTCN-3 Record Type			
Name	**NR_BcchInfo_Type**		
Comment	Configuration of system information message contents to be scheduled at the SS		
MIB	BCCH_BCH_Message	opt	TS 38.331, clause 6.2.1 BCCH-BCH-Message and clause 6.2.2 MIB; NOTE: the system frame number included in MIB needs to be handled and maintained by the system simulator; that means that the system frame number being setup by TTCN shall be ignored and overwritten by the SS
SIB1	BCCH_DL_SCH_Message	opt	TS 38.331, clause 6.2.1 BCCH-DL-SCH-Message and clause 6.2.2 SIB1
SIs	NR_SI_List_Type	opt	list of SIs corresponding to SiList of NR_AllOtherSiSchedul_Type (i.e. element i of NR_AllOtherSiSchedul_Type's SiList specifies the scheduling for SIs[i])
SegmentedSIs	NR_SegmentedSI_List_Type	opt	list of SIs containing segmented SIBs; corresponds to SegmentedSiList in AllSiSchedul_Type !!!! NR-SA-TBD: check whether this is needed !!!!

NR_BcchConfig_Type

TTCN-3 Record Type			
Name	**NR_BcchConfig_Type**		
Comment	Configuration of system information scheduling and content at the SS		
Pbch	NR_BcchToPbchConfig_Type	opt	
Pdsch	NR_BcchToPdschConfig_Type	opt	
BcchInfo	NR_BcchInfo_Type	opt	

D.1.3.5 Paging_Control

Primitive to configuration PCCH/PCH

NR_PcchConfig_Type

TTCN-3 Record Type			
Name	**NR_PcchConfig_Type**		
Comment	configuration for PCCH mapped to PCH mapped to PDSCH		
SearchSpaceA ndDci	NR_SearchSpaceDlDciAssi gnment_Type	opt	in general Paging happens at the BWP currently being configured as active BWP at the SS and Type2-PDCCH common search space is used for scheduling; NOTE: there is no use case to schedule Paging simultaneously in multiple BWPs

D.1.3.6 CCCH_DCCH_DTCH_Configuration

NR_CcchDcchDtchConfigDL_Type

TTCN-3 Record Type			
Name	**NR_CcchDcchDtchConfigDL_Type**		
Comment	configuration for CCCH/DCCH/DTCH mapped to DL-SCH mapped to DL-SCH mapped to PDSCH; !!!! NR-NOTE 1: in contrast to EUTRA the configuration of HARQ processes to be used is done as part of DCI configuration !!!! !!!! NR-NOTE 2: it seems that this type provides configuration for DCCH and DTCH only; nevertheless for now the name kept !!!!		
SearchSpaceA ndDci	NR_SearchSpaceDlDciAssi gnment_Type	opt	in general DCCH/DTCH transmissions happen at the BWP currently being the active BWP at the SS and the UE specific search space is used for scheduling; DCI configuration for Msg2 of the RACH procedure is done as part of the RACH procedure configuration (NR_RandomAccessResponseConfig_Type)

NR_CcchDcchDtchConfigUL_Type

TTCN-3 Record Type			
Name	**NR_CcchDcchDtchConfigUL_Type**		
Comment	scheduling for CCCH/DCCH/DTCH mapped to UL-SCH mapped to PUSCH !!!! NR-NOTE: it seems that this type provides configuration for DCCH and DTCH only; nevertheless for now the name kept !!!!		
SearchSpaceA ndDci	NR_SearchSpaceUlDciAssi gnment_Type	opt	in general DCCH/DTCH transmissions happen at the BWP currently being the active BWP at the SS and the UE specific search space is used for scheduling
PUCCH_Synch	NR_UplinkTimeAlignment_ Synch_Type	opt	parameters for automatic control of timing advance
GrantConfig	UL_GrantConfig_Type	opt	configuration how UL grant allocation is done (as response to scheduling request, periodically, etc.

NR_DrxCtrl_Type

TTCN-3 Union Type		
Name	**NR_DrxCtrl_Type**	
Comment	DRX configuration for connected mode (TS 38.321, clause 5.7)	
None	Null_Type	DRX not configured
Config	NR_ASN1_DRX_Config_Type	DRX is configured as signalled to the UE

NR_MeasGapCtrl_Type

TTCN-3 Union Type		
Name	**NR_MeasGapCtrl_Type**	
Comment	support of measurement gap configuration	
None	Null_Type	no measurement gap configuration
Config	NR_ASN1_MeasGapConfig_Type	measurement gap configuration acc. to TS 38.331, clause 5.5.2.9; NOTE: the release branch of MeasGapConfig in general is not used for configuration of the SS

NR_CcchDcchDtchConfig_Type

TTCN-3 Record Type			
Name	**NR_CcchDcchDtchConfig_Type**		
Comment			
DL	NR_CcchDcchDtchConfigDL_Type	opt	Scheduling, parameters related to CCCH, DCCH and DTCH in DL
UL	NR_CcchDcchDtchConfigUL_Type	opt	Scheduling, parameters related to CCCH, DCCH and DTCH in UL
DrxCtrl	NR_DrxCtrl_Type	opt	DRX configuration as sent to the UE (or 'None' when the UE does not support connected mode DRX)
MeasGapCtrl	NR_MeasGapCtrl_Type	opt	to tell the SS when no assignments/grants shall be assigned to the UE

D.1.3.7   Cell_Group_Configuration

Configuration of cell group(s) in terms of dual connecivity and carrier aggregation

Cell_Group_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_ServingCellIndex_Type	integer	corresponds to ASN.1 (v15.1.0) definitions SCellIndex (1..31) and ServCellIndex (0..maxNrofServingCells-1): According to ASN.1 "The value range is shared across the Cell Groups" and "the PCell of the Master Cell Group uses ID = 0"

NR_ServingCellConfig_Type

TTCN-3 Union Type		
Name	**NR_ServingCellConfig_Type**	
Comment	serving cell capabilities of a cell	
SpCell	NR_SpCellConfig_Type	parameters specific for an SpCell and cell group configuration
SCell	NR_SCellConfig_Type	parameters specific for an SCell
None	Null_Type	the is no serving cell at all (e.g. neighbouring cell only)

NR_SCellConfig_Type

TTCN-3 Record Type			
Name	**NR_SCellConfig_Type**		
Comment	cell parameters specific for an SCell; NOTE: the corresponding SpCell can be derived from the SpCell's SCellList; further parameters may be added according to test requirements for CA test cases		
ServingCellIndex	NR_ServingCellIndex_Type	opt	
TAG_Id	TAG_Id	opt	Id of the Timing Advance Group the SCell belongs to (according to TS 38.321 clause 6.1.3.4 the SpCell has the TAG Identity 0); the SS shall use the given TAG_Id e.g. for automatic time alignment in UL (see NR_UplinkTimeAlignment_AutoSynch_Type)

NR_SpCellConfig_Type

TTCN-3 Record Type			
Name	**NR_SpCellConfig_Type**		
Comment	cell parameters specific for an SpCell (PCell of the MCG or the PSCell of the SCG) and additionall parameters of the cell group; further parameters may be added according to test requirements for CA test cases		
ServingCellIndex	NR_ServingCellIndex_Type	opt	
CellGroupConfig	NR_SpCell_CellGroupConfig_Type	opt	parameters of the cell group of which the cell is SpCell (PCell or PSCell): assigned to SpCell as in many test cases the cell group consists of the SpCell only and on the other hand every cell group has to have at least an SpCell

NR_SpCell_CellGroupConfig_Type

TTCN-3 Record Type			
Name	**NR_SpCell_CellGroupConfig_Type**		
Comment	Configuration of an NR cell group; NOTE 1: The type of cell group (MCG, SCG) may be derived from the CellGroupId (CellGroupId==0 => MCG, CellGroupId>0 => SCG) NOTE 2: Further cell group specific MAC and PHY parameters may be added corresponding to ASN.1 MAC-CellGroupConfig or may need to be added (but e.g. the DRX configuration is assigned to NR_CcchDcchDtchConfig_Type already i.e. there is no need to configure it here)		
CellGroupId	CellGroupId	opt	0 for MCG (i.e. EUTRA in EN-DC), 1 for SCG (NR in EN-DC); see comments to ASN.1 definition of CellGroupId (v15.1.0)
SCellList	NR_CellIdList_Type	opt	list of SCells belonging to the SpCell's cell group; shall be initialised as empty list
MAC_CellGroupConfig	NR_ASN1_MAC_CellGroupConfig_Type	opt	Cell group specific MAC parameters as sent to the UE in CellGroupConfig.MAC-CellGroupConfig
PhysicalCellGroupConfig	NR_ASN1_PhysicalCellGroupConfig_Type	opt	Cell group specific physical layer parameters as sent to the UE in CellGroupConfig.PhysicalCellGroupConfig

D.1.4 Cell_Power_Attenuation

NR_CellAttenuationConfig_Type

TTCN-3 Record Type			
Name	**NR_CellAttenuationConfig_Type**		
Comment			
CellId	NR_CellId_Type		
Attenuation	NR_Attenuation_Type		
TimingInfo	TimingInfo_Type	opt	

NR_CellAttenuationList_Type

TTCN-3 Record of Type	
Name	**NR_CellAttenuationList_Type**
Comment	
record of NR_CellAttenuationConfig_Type	

D.1.5   Radio_Bearer_Configuration

Radio Bearer Configuration: SRBs/DRBs
NOTE: Type definitions for PDCP configuration are in NR_PDCP_TypeDefs

NR_RadioBearerConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_RadioBearerConfigInfo_Type**		
Comment	semantics of omit: "keep as it is"		
Pdcp	NR_PDCP_Configuration_Type	opt	for SRB0: "Pdcp.None:=true" mandatory for initial configuration; omit means "keep as it is"
Rlc	NR_RLC_Configuration_Type	opt	mandatory for initial configuration; omit means "keep as it is"
LogicalChannelId	NR_LogicalChannelId_Type	opt	DRBs: DTCH-LogicalChannelIdentity as for rb-MappingInfo in DRB-ToAddModifyList; SRBs: for SRBs specified configurations acc. to TS 36.331, clause 9.1.2 shall be applied: SRB1: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 1 SRB2: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 2 for SRB0 being mapped to CCCH the LCID is '00000'B acc. to TS 36.321, clause 6.2.1; mandatory for initial configuration; omit means "keep as it is"
Mac	NR_MAC_Configuration_Type	opt	

DiscardULData	boolean	opt	if omitted:
			  initial configuration: data is handed over to TTCN as usual
			  re-configuration: "keep as it is"
			if set:
			  true - SS shall discard any data in UL for this radio bearer
			  false - (re)configuration back to normal mode
			NOTE: typically applicable for UM DRBs only

NR_RadioBearerConfig_Type

TTCN-3 Union Type		
Name	**NR_RadioBearerConfig_Type**	
Comment		
AddOrReconfigure	NR_RadioBearerConfigInfo_Type	add / re-configure RB - CellId : identifier of the cell being configured RoutingInfo : 'None' TimingInfo : 'Now' in common ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)
Release	Null_Type	release RB - CellId : identifier of the cell being configured RoutingInfo : 'None' TimingInfo : 'Now' in common ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)

NR_RadioBearer_Type

TTCN-3 Record Type			
Name	**NR_RadioBearer_Type**		
Comment			
Id	NR_RadioBearerId_Type		either for SRB or DRB
Config	NR_RadioBearerConfig_Type		

NR_RadioBearerList_Type

TTCN-3 Record of Type		
Name	**NR_RadioBearerList_Type**	
Comment	array of SRBs and/or DRBs	
record of NR_RadioBearer_Type		

D.1.5.1 RLC_Configuration

RLC configuration: radio bearer specific

RLC_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_SS_RLC_TM_Type	Null_Type	TM to configure SRB0; no parameters to be defined

NR_RLC_TestModeInfo_Type

TTCN-3 Record Type	
Name	**NR_RLC_TestModeInfo_Type**
Comment	!!!! NR-TBD !!!!

NR_RLC_TestModeConfig_Type

TTCN-3 Union Type		
Name	**NR_RLC_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	NR_RLC_TestModeInfo_Type	

NR_SS_RLC_AM_Type

TTCN-3 Record Type			
Name	**NR_SS_RLC_AM_Type**		
Comment			
Tx	NR_ASN1_UL_AM_RLC_Type	opt	the UE's UL setting to be used in SS's tx direction
Rx	NR_ASN1_DL_AM_RLC_Type	opt	the UE's DL setting to be used in SS's rx direction

NR_SS_RLC_UM_Type

TTCN-3 Record Type			
Name	**NR_SS_RLC_UM_Type**		
Comment			
Tx	NR_ASN1_UL_UM_RLC_Type	opt	the UE's UL setting to be used in SS's tx direction
Rx	NR_ASN1_DL_UM_RLC_Type	opt	the UE's DL setting to be used in SS's rx direction

NR_RLC_RbConfig_Type

TTCN-3 Union Type		
Name	**NR_RLC_RbConfig_Type**	
Comment	!!!! NR-NOTE: in EUTRA UM_OnlyUL is not used at all and UM_OnlyDL is used for MBMS only => not defined for NR (yet) !!!!	
AM	NR_SS_RLC_AM_Type	
UM	NR_SS_RLC_UM_Type	
TM	NR_SS_RLC_TM_Type	normally SRB0 only; may be used for test purposes also

NR_RLC_Configuration_Type

TTCN-3 Record Type			
Name	**NR_RLC_Configuration_Type**		
Comment			
Rb	NR_RLC_RbConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	NR_RLC_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"

D.1.5.2   MAC_Configuration

MAC configuration: radio bearer specific configuration

MAC_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_LogicalChannelId_Type	UInt_Type	

NR_MAC_Test_DLLogChID_Type

TTCN-3 Union Type		
Name	**NR_MAC_Test_DLLogChID_Type**	
Comment		
LogChId	NR_LogicalChannelId_Type	Specifies to over write the logical channel ID in MAC header in all the DL messages sent on the configured logical channel
ConfigLchId	Null_Type	Specifies that the normal mode of correct logical channel ID to be used in DL MAc header. This will be the default mode, when SS is initially configured.

NR_MAC_Test_SCH_NoHeaderManipulation_Type

TTCN-3 Enumerated Type	
Name	**NR_MAC_Test_SCH_NoHeaderManipulation_Type**
Comment	
NormalMode	MAC header is fully controlled by the SS
DL_SCH_Only	TTCN can submit a final MAC PDU including header and payloads; SS does not do anything with this MAC PDU i.e. no header is added for the DL SCH transport channel. It is possible that data belonging to multiple DRBs is sent in one MAC PDU and from one special RB configured. NOTE: SRBs shall work as in normal mode and data can be sent/received on SRBs but sending on SRBs shall be in different TTIs than sending data PDUs.
DL_UL_SCH	In UL and DL the SS' MAC layer is transparent i.e. SS does not add or remove any MAC header

NR_MAC_TestModeInfo_Type

TTCN-3 Record Type			
Name	**NR_MAC_TestModeInfo_Type**		
Comment	Parameters/Configuration for MAC tests		
DiffLogChId	NR_MAC_Test_DLLogChID_Type		to be used in test cases 7.1.1.1 and 7.1.1.2 for using a different logical channel ID in MAC-header on DL-SCH channel
No_HeaderManipulation	NR_MAC_Test_SCH_NoHeaderManipulation_Type		to configure mode for no header manipulation in SS MAC layer for DL/UL SCH

NR_MAC_TestModeConfig_Type

TTCN-3 Union Type			
Name	**NR_MAC_TestModeConfig_Type**		
Comment			
None	Null_Type		
Info	NR_MAC_TestModeInfo_Type		

NR_MAC_LogicalChannelConfig_Type

TTCN-3 Record Type			
Name	**NR_MAC_LogicalChannelConfig_Type**		
Comment			
Priority	integer		logical channel priority for the DL as described in TS 38.321, clause 5.4.3.1 for the UL
PrioritizedBitRate	NR_PrioritizedBitRate_Type		PBR as described for the UL; probably not needed at SS

NR_MAC_Configuration_Type

TTCN-3 Record Type			
Name	**NR_MAC_Configuration_Type**		
Comment			
LogicalChannel	NR_MAC_LogicalChannelConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	NR_MAC_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"; for none MAC tests "TestMode.None:=true"

D.1.6   AS_Security

Primitive for control of AS security

NR_PdcpSQN_Type

TTCN-3 Record Type			
Name	**NR_PdcpSQN_Type**		
Comment			
Format	NR_PdcpCountFormat_Type		12 bit or 18 bit SQN
Value	integer		SQN value (12 bit or 18 bit SQN) NOTE: in TTCN the test case writer is responsible to deal with potential overflows (e.g. there shall be a "mod 32", "mod 128" or "mod 4096" according to the format)

NR_PDCP_ActTime_Type

TTCN-3 Union Type		
Name	**NR_PDCP_ActTime_Type**	
Comment	The sequence number in UL and DL for SRB1 should be one more than the present SQN, as Ciphering starts in UL and DL soon after SMC and SMComp; For other SRB/DRB it should be the present SQN.	
None	Null_Type	No Activation time; to be used if Ciphering is not applied
SQN	NR_PdcpSQN_Type	PDCP sequence number

NR_SecurityActTime_Type

TTCN-3 Record Type			
Name	**NR_SecurityActTime_Type**		
Comment			
RadioBearerId	NR_RadioBearerId_Type		
UL	NR_PDCP_ActTime_Type		
DL	NR_PDCP_ActTime_Type		

NR_SecurityActTimeList_Type

TTCN-3 Record of Type	
Name	**NR_SecurityActTimeList_Type**
Comment	
record of NR_SecurityActTime_Type	

NR_AS_IntegrityInfo_Type

TTCN-3 Record Type			
Name	**NR_AS_IntegrityInfo_Type**		
Comment	for initial configuration activation time is not needed for integrity protection as all messages in DL after security activation are integrity protected; this means this ASP is invoked before transmission of Security mode command; if there is a integrity violation in UL SS shall set the IndicationStatus in the common ASP part to flag the integrity error (IndicationStatus.Error.Integrity.Pdcp := true); integrity to be provided for each SRB as per core spec		
Algorithm	IntegrityProtAlgorithm		IntegrityProtAlgorithm_Type being defined in RRC ASN.1
KRRCint	B128_Key_Type		
KUPint	B128_Key_Type	opt	Not used when UE connected to EPS (i.e. set to omit for EPS)
ActTimeList	NR_SecurityActTimeList_Type	opt	omit for initial configuration (i.e. all SRBs to be integrity protected immediately); in HO scenarios activation time may be needed e.g. for SRB1

NR_AS_CipheringInfo_Type

TTCN-3 Record Type			
Name	**NR_AS_CipheringInfo_Type**		
Comment			
Algorithm	CipheringAlgorithm		CipheringAlgorithm_Type being defined in RRC ASN.1
KRRCenc	B128_Key_Type		
KUPenc	B128_Key_Type		KUPenc is mandatory; and SS uses it when DRB are configured
ActTimeList	NR_SecurityActTimeList_Type		

NR_AS_SecStartRestart_Type

TTCN-3 Record Type			
Name	**NR_AS_SecStartRestart_Type**		
Comment			
Integrity	NR_AS_IntegrityInfo_Type	opt	optional to allow separated activation of integrity and ciphering; omit: keep as it is
Ciphering	NR_AS_CipheringInfo_Type	opt	optional to allow separated activation of integrity and ciphering; omit: keep as it is

NR_AS_Security_Type

TTCN-3 Union Type		
Name	**NR_AS_Security_Type**	
Comment	Security mode command procedure (TS 38.331, clause 5.3.4): !!!! NR-FFS: both SMC and SMComp are integrity protected !!!! !!!! NR-FFS: (nevertheless SS shall be able to cope with unprotected SM reject); !!!! !!!! NR-FFS: ciphering is started just after SMComp (acc. to TS 38.331, clause 5.3.4.3 and 5.3.1.1) !!!!	
StartRestart	NR_AS_SecStartRestart_Type	information to start/restart AS security protection in the PDCP
Release	Null_Type	to release AS security protection in the PDCP

D.1.7   System_Indication_Control

Primitive for control of system indications for special purposes

NR_System_IndicationControl_Type

TTCN-3 Record Type			
Name	**NR_System_IndicationControl_Type**		
Comment	Initially all indications apart from "Error" are disabled in SS (i.e. it shall not be necessary in 'normal' test cases to use this primitive but only if a specific indication is needed); omit means indication mode is not changed		
RLC_Discard	IndicationAndControlMode_Type	opt	To enable/disable reporting of discarded RLC PDUs
MAC_BSR	IndicationAndControlMode_Type	opt	To enable/disable reporting of short/long BSR
MAC_PHR	IndicationAndControlMode_Type	opt	To enable/disable reporting of short/long PHR
RachPreamble	IndicationAndControlMode_Type	opt	To enable/disable reporting of PRACH preamble
SchedReq	IndicationAndControlMode_Type	opt	To enable/disable reporting of Scheduling Request
UL_HARQ	IndicationAndControlMode_Type	opt	To enable/disable reporting of reception of HARQ ACK/NACK
HarqError	IndicationAndControlMode_Type	opt	To enable/disable reporting of HARQ errors

D.1.8   PDCP_Count

Primitives to enquire PDCP COUNT

NR_PdcpCountFormat_Type

TTCN-3 Enumerated Type	
Name	**NR_PdcpCountFormat_Type**
Comment	
PdcpCount_Srb	20 bit HFN; 12 bit SQF
PdcpCount_DrbSQN 12	20 bit HFN; 12 bit SQF
PdcpCount_DrbSQN 18	14 bit HFN; 18 bit SQF

NR_PdcpCount_Type

TTCN-3 Record Type			
Name	**NR_PdcpCount_Type**		
Comment			
Format	NR_PdcpCountFormat_Type		
Value	PdcpCountValue_Type		

NR_PdcpCountInfo_Type

TTCN-3 Record Type			
Name	**NR_PdcpCountInfo_Type**		
Comment			
RadioBearerId	NR_RadioBearerId_Type		
UL	NR_PdcpCount_Type	opt	omit: keep as it is
DL	NR_PdcpCount_Type	opt	omit: keep as it is

NR_PdcpCountInfoList_Type

TTCN-3 Record of Type	
Name	**NR_PdcpCountInfoList_Type**
Comment	
record of NR_PdcpCountInfo_Type	

NR_PdcpCountGetReq_Type

TTCN-3 Union Type		
Name	**NR_PdcpCountGetReq_Type**	
Comment		
AllRBs	Null_Type	return COUNT values for all RBs being configured
SingleRB	NR_RadioBearerId_Type	

NR_PDCP_CountReq_Type

TTCN-3 Union Type		
Name	**NR_PDCP_CountReq_Type**	
Comment		
Get	NR_PdcpCountGetReq_Type	Request PDCP count for one or all RBs being configured at the PDCP
Set	NR_PdcpCountInfoList_Type	Set PDCP count for one or all RBs being configured at the PDCP; list for RBs which's COUNT shall be manipulated

<div align="center">**NR_PDCP_CountCnf_Type**</div>

TTCN-3 Union Type		
Name	**NR_PDCP_CountCnf_Type**	
Comment		
Get	NR_PdcpCountInfoList_Type	RBs in ascending order; SRBs first
Set	Null_Type	

D.1.9   L1_Test_Mode

Primitive for control of L1 Test Modes

<div align="center">**NR_L1_TestMode_Type**</div>

TTCN-3 Record Type		
Name	**NR_L1_TestMode_Type**	
Comment		
DL_SCH_CRC	DL_SCH_CRC_Type	Manipulation of CRC bit generation for DL-SCH
Phich	NR_DL_HARQ_TestMode_Type	HARQ feedback mode

<div align="center">**NR_MAC_Test_DL_SCH_CRC_Mode_Type**</div>

TTCN-3 Enumerated Type	
Name	**NR_MAC_Test_DL_SCH_CRC_Mode_Type**
Comment	
Normal	default mode, the CRC generation is correct
Erroneous	SS shall generate CRC error by toggling CRC bits; the CRC error shall be applied for all PDUs of the given RNTI and their retransmission until SS is configured back to 'normal' operation
Error1AndNormal	the SS generates wrong CRC for first transmission and correct CRC on first retransmission. Later SS operates in normal mode. The retransmission is automatically triggered by reception of HARQ NACK

<div align="center">**DL_SCH_CRC_Type**</div>

TTCN-3 Union Type		
Name	**DL_SCH_CRC_Type**	
Comment	NOTE: CRC error mode for RA_RNTI is not addressed as it will be configured in RACHProcedureConfig	
C_RNTI	NR_MAC_Test_DL_SCH_CRC_Mode_Type	to configure mode for CRC bit for all MAC PDU's for which C-RNTI is used in PDCCH transmission
SI_RNTI	NR_MAC_Test_DL_SCH_CRC_Mode_Type	to configure mode for CRC bit for all MAC PDU's for which SI-RNTI is used in PDCCH transmission
SPS_RNTI	NR_MAC_Test_DL_SCH_CRC_Mode_Type	to configure mode for CRC bit for all MAC PDU's for which SPS-RNTI is used in PDCCH transmission

<div align="center">**NR_DL_HARQ_TestMode_Type**</div>

TTCN-3 Union Type		
Name	**NR_DL_HARQ_TestMode_Type**	
Comment		
NormalMode	Null_Type	normal HARQ mode
ExplicitMode	HARQ_ModeList_Type	the number of elements in explicit list shall match the number of retransmissions being expected

D.1.10 DCI_Trigger

Primitive to trigger SS to send specific DCI (e.g. PDCCH order)

NR_DCI_Trigger_Type

TTCN-3 Union Type		
Name	**NR_DCI_Trigger_Type**	
Comment		
PdcchOrder	NR_PDCCH_Order_Type	
DciFormat_2_0	NR_DciFormat_2_0_Type	
DciFormat_2_1	NR_DciFormat_2_1_Type	
DciFormat_2_2	NR_DciFormat_2_2_Type	
DciFormat_2_3	NR_DciFormat_2_3_Type	

NR_PDCCH_Order_Type

TTCN-3 Record Type	
Name	**NR_PDCCH_Order_Type**
Comment	PDCCH order to initiate RA procedure (TS 38.321, clause 5.1.1) !!!! NR-FFS: to be defined, reference to 38.212 to be added !!!!

NR_DciFormat_2_0_Type

TTCN-3 Record Type	
Name	**NR_DciFormat_2_0_Type**
Comment	TS 38.212 clause 7.3.3.1: for notifying the slot format; default parameters according to TS 38.508-1 clause 4.3.6.1.3.1; place-holder to be replaced when there are test cases dealing with DCI format 2_0; NOTE: SS also may need SlotFormatIndicator configuration as signalled to the UE in PDCCH-Config.slotFormatIndicator

NR_DciFormat_2_1_Type

TTCN-3 Record Type	
Name	**NR_DciFormat_2_1_Type**
Comment	TS 38.212 clause 7.3.3.2: notifying the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE; default parameters according to TS 38.508-1 clause 4.3.6.1.3.2; place-holder to be replaced when there are test cases dealing with DCI format 2_1; NOTE: SS also may need DownlinkPreemption configuration as signalled to the UE in PDCCH-Config.downlinkPreemption

NR_DciFormat_2_2_Type

TTCN-3 Record Type	
Name	**NR_DciFormat_2_2_Type**
Comment	TS 38.212 clause 7.3.3.3: for the transmission of TPC commands for PUCCH and PUSCH; default parameters according to TS 38.508-1 clause 4.3.6.1.3.3; place-holder to be replaced when there are test cases dealing with DCI format 2_2; NOTE: SS may need additional configuration as signalled to the UE in PDCCH-Config.tpc-PUSCH and PDCCH-Config.tpc-PUCCH

NR_DciFormat_2_3_Type

TTCN-3 Record Type	
Name	**NR_DciFormat_2_3_Type**
Comment	TS 38.212 clause 7.3.3.4: for the transmission of a group of TPC commands for SRS transmissions by one or more UEs; default parameters according to TS 38.508-1 clause 4.3.6.1.3.4; place-holder to be replaced when there are test cases dealing with DCI format 2_3; NOTE: SS may need additional configuration as signalled to the UE in PDCCH-Config.tpc-PUSCH and PDCCH-Config.tpc-PUCCH

D.1.11 System_Indications

Primitives for System indications

NR_HarqProcessInfo_Type

TTCN-3 Record Type			
Name	**NR_HarqProcessInfo_Type**		
Comment			
Id	NR_HarqProcessId_Type		

NR_HarqError_Type

TTCN-3 Union Type			
Name	**NR_HarqError_Type**		
Comment			
UL	NR_HarqProcessInfo_Type		indicates HARQ error detected at the SS side (error at UL transmission)
DL	NR_HarqProcessInfo_Type		indicates HARQ NACK sent by the UE (error at DL transmission)

NR_RachPreamble_Type

TTCN-3 Record Type			
Name	**NR_RachPreamble_Type**		
Comment			
RAPID	integer		indicates the RAPID of the preamble (integer (0..63))

NR_RlcDiscardInd_Type

TTCN-3 Record Type			
Name	**NR_RlcDiscardInd_Type**		
Comment	SS shall send this indication if it discards a received RLC AMD PDU as specified in TS 38.322 cl. 5.2.3.2.2		
SequenceNumber	integer		sequence number of the PDU being discarded

D.1.12 System_Interface

NR_SYSTEM_CTRL_REQ

TTCN-3 Record Type			
Name	**NR_SYSTEM_CTRL_REQ**		
Comment			
Common	NR_ReqAspCommonPart_Type		TimingInfo depends on respective primitive:

Request	NR_SystemRequest_Type		- Cell
			  TimingInfo: 'now' (in general)
			- CellAttenuationList
			  TimingInfo: 'now' (in general, but activation time may be used also)
			- RadioBearerList
			  TimingInfo: 'now' in general;
			   activation time may be used in special case for release and/or reconfiguration of one or several RBs;
			   the following rules shall be considered:
			    - release/Reconfiguration of an RB shall not be scheduled ealier than 5ms after a previous data transmission on this RB
			    - subsequent release and reconfiguration(s) shall be scheduled with an interval of at least 5ms
			    - a subsequent data transmission on an RB shall not be scheduled ealier than 5ms after the last reconfiguration of the RB
			   the configuration shall be performed exactly at the given time
			- EnquireTiming
			  TimingInfo: 'now'
			- AS_Security
			  TimingInfo: 'now';
			  NOTE: "activation time" may be specified in the primitive based on PDCP SQN
			- Sps
			  TimingInfo: activation time for SPS assignment transmission
			- Paging
			  TimingInfo: Calculated paging occasion
			- L1MacIndCtrl
			  TimingInfo: 'now' (in general)
			- PdcpCount
			  TimingInfo: 'now' (in general)
			  activation time may be used in case of CA inter cell handover to set the PdcpCount
			- L1_TestMode
			  TimingInfo: depends on the test mode;
			  activation time is used e.g. for manipulation of the CRC
			- PdcchOrder
			  TimingInfo: 'now' (in general)

NR_SYSTEM_CTRL_CNF

TTCN-3 Record Type			
Name	**NR_SYSTEM_CTRL_CNF**		
Comment			
Common	NR_CnfAspCommonPart_Type		TimingInfo is ignored by TTCN (apart from EnquireTiming) => SS may set TimingInfo to "None"
Confirm	NR_SystemConfirm_Type		

NR_SYSTEM_IND

TTCN-3 Record Type			
Name	**NR_SYSTEM_IND**		
Comment			
Common	NR_IndAspCommonPart_Type		The SS shall provide TimingInfo depending on the respective indication:

Indication	NR_SystemIndication_Type		- Error
			  TimingInfo: related to the error (if available)
			- RlcDiscardInd
			  TimingInfo: slot in which the RLC PDU has been received
			- MAC
			  TimingInfo: slot in which the MAC PDU has been received containing the MAC CE being indicated
			- RachPreamble
			  TimingInfo: start of the RACH preamble
			- SchedReq
			  TimingInfo: slot containing the SR
			- UL_HARQ
			  TimingInfo: slot containing the UL HARQ
			- HarqError
			  TimingInfo: slot containing the UL HARQ

NR_SYSTEM_PORT

TTCN-3 Port Type		
Name	**NR_SYSTEM_PORT**	
Comment	NR PTC: Port for system configuration	
out	NR_SYSTEM_CTRL_REQ	
in	NR_SYSTEM_CTRL_CNF	

NR_SYSIND_PORT

TTCN-3 Port Type		
Name	**NR_SYSIND_PORT**	
Comment	NR PTC: Port for system indications	
in	NR_SYSTEM_IND	

D.2 NR_ASP_DrbDefs

ASP interface for DRBs

D.2.1 PDU_TypeDefs

D.2.1.1 MAC_PDU

NR_MAC_PDU_DL_Type

TTCN-3 Record Type			
Name	**NR_MAC_PDU_DL_Type**		
Comment			
CE_SubPDUList	NR_MAC_CE_SubPDU_DL_List_Type	opt	list of subPDUs with MAC CE
SDU_SubPDUList	NR_MAC_SDU_SubPDU_List_Type	opt	list of subPDUs with MAC SDU
Padding_SubPDU	NR_MAC_Padding_SubPDU_Type	opt	subPDU with padding

NR_MAC_PDU_UL_Type

TTCN-3 Record Type			
Name	**NR_MAC_PDU_UL_Type**		
Comment			
SDU_SubPDUList	NR_MAC_SDU_SubPDU_List_Type	opt	list of subPDUs with MAC SDU
CE_SubPDUList	NR_MAC_CE_SubPDU_DL_List_Type	opt	list of subPDUs with MAC CE
Padding_SubPDU	NR_MAC_Padding_SubPDU_Type	opt	subPDU with padding

NR_MAC_PDU_Type

TTCN-3 Union Type	
Name	**NR_MAC_PDU_Type**
Comment	
DL	NR_MAC_PDU_DL_Type
UL	NR_MAC_PDU_UL_Type

NR_MAC_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_PDUList_Type**
Comment	
record of NR_MAC_PDU_Type	

D.2.1.1.1   MAC_PDU_SubPDU

MAC subPDU (TS 38.321 clause 6.1.2)

MAC_PDU_SubPDU: Basic Type Definitions

TTCN-3 Basic Types		
B8_16_Type	bitstring length(8..16)	NOTE: length restriction can only be a range but not two distinct lengths
NR_MAC_SDU_Type	octetstring	

NR_MAC_PDU_SubHeader_Type

TTCN-3 Record Type			
Name	**NR_MAC_PDU_SubHeader_Type**		
Comment	MAC PDU SubHeader (TS 38.321 clause 6.1.2)		
Reserved	B1_Type		Reserved bit
Format	B1_Type		F: The Format field indicates the size of the Length field according to TS 38.321 clause 6.2.1: value 0 => 8 bits, value 1 => 16 bits
LCID	B6_Type		LCID: Logical Channel ID field according to TS 38.321 Tables 6.2.1-1 and 6.2.1-2
Length	B8_16_Type	opt	Either omit (fixed-sized MAC CE) or 8 bits (F=0) or 16 bits (F=1)

NR_MAC_CE_SubPDU_DL_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SubPDU_DL_Type**		
Comment	MAC DL subPPU with MAC subheader only (in case of MAC CE with fixed size of zero bits) or MAC subheader + MAC CE		
SubHeader	NR_MAC_PDU_SubHeader_Type		
ControlElement	NR_MAC_ControlElementDL_Type	opt	omit if MAC CE has fixed size of zero bits

NR_MAC_CE_SubPDU_DL_List_Type

TTCN-3 Set of Type
Name   NR_MAC_CE_SubPDU_DL_List_Type
Comment
set of NR_MAC_CE_SubPDU_DL_Type

NR_MAC_SDU_SubPDU_Type

TTCN-3 Record Type			
Name	**NR_MAC_SDU_SubPDU_Type**		
Comment	MAC subPPU with MAC subheader + MAC SDU		
SubHeader	NR_MAC_PDU_SubHeader_Type		
SDU	NR_MAC_SDU_Type		

NR_MAC_SDU_SubPDU_List_Type

TTCN-3 Set of Type
Name   NR_MAC_SDU_SubPDU_List_Type
Comment
set of NR_MAC_SDU_SubPDU_Type

NR_MAC_Padding_SubPDU_Type

TTCN-3 Record Type			
Name	**NR_MAC_Padding_SubPDU_Type**		
Comment	MAC subPPU with MAC subheader + Padding		
SubHeader	NR_MAC_PDU_SubHeader_Type		
Padding	octetstring		0 or more octets padding

D.2.1.1.2   MAC_ControlElements

MAC Control Elements (CEs) (TS 38.321 clause 6.1.3)

NR_MAC_ControlElementDL_Type

TTCN-3 Union Type		
Name	**NR_MAC_ControlElementDL_Type**	
Comment		
ContentionResolutionID	NR_MAC_CE_ContentionResolutionId_Type	TS 38.321 clause 6.1.3.3
TimingAdvance	NR_MAC_CE_TimingAdvance_Type	TS 38.321 clause 6.1.3.4
SCellActDeact	NR_MAC_CE_SCellActDeact_Type	TS 38.321 clause 6.1.3.10
DuplicationActDeact	NR_MAC_CE_DuplicationActDeact_Type	TS 38.321 clause 6.1.3.11
SP_ResourceSetActDeact	NR_MAC_CE_SP_ResourceSetActDeact_Type	TS 38.321 clause 6.1.3.12
CSI_TriggerStateSubselection	NR_MAC_CE_CSI_TriggerStateSubselection_Type	TS 38.321 clause 6.1.3.13
TCI_StatesActDeact	NR_MAC_CE_TCI_StatesActDeact_Type	TS 38.321 clause 6.1.3.14
TCI_StateIndication	NR_MAC_CE_TCI_StateIndication_Type	TS 38.321 clause 6.1.3.15
SP_CSI_ReportingActDeact	NR_MAC_CE_SP_CSI_ReportingActDeact_Type	TS 38.321 clause 6.1.3.16
SP_SRS_ActDeact	NR_MAC_CE_SP_SRS_ActDeact_Type	TS 38.321 clause 6.1.3.17
PUCCH_SpatialRelationActDeact	NR_MAC_CE_PUCCH_SpatialRelationActDeact_Type	TS 38.321 clause 6.1.3.18
SP_ZP_ResourceSetActDeact	NR_MAC_CE_SP_ZP_ResourceSetActDeact_Type	TS 38.321 clause 6.1.3.19

NR_MAC_ControlElementUL_Type

TTCN-3 Union Type		
Name	**NR_MAC_ControlElementUL_Type**	
Comment		
ShortBSR	NR_MAC_CE_ShortBSR_Type	TS 38.321 clause 6.1.3.1
LongBSR	NR_MAC_CE_LongBSR_Type	TS 38.321 clause 6.1.3.1
C_RNTI	RNTI_B16_Type	TS 38.321 clause 6.1.3.2
SingleEntryPHR	NR_MAC_CE_SingleEntryPHR_Type	TS 38.321 clause 6.1.3.8
MultiEntryPHR	NR_MAC_CE_MultiEntryPHR_Type	TS 38.321 clause 6.1.3.9

D.2.1.1.2.1   MAC_ControlElement_Common

NR_MAC_CE_SCellFlags_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SCellFlags_Type**		
Comment	bitmap to indicate presence of SCell with SCellIndex according to TS 38.331 either SCellIndex7_1 is present only or all octets are present		
SCellIndex7_1	B8_Type		leftmost bit corresponds to SCellIndex7, 2nd bit from the right corresponds to SCellIndex1, rightmost bit is reserved
SCellIndex15_8	B8_Type	opt	leftmost bit corresponds to SCellIndex15, rightmost bit corresponds to SCellIndex8
SCellIndex23_16	B8_Type	opt	leftmost bit corresponds to SCellIndex23, rightmost bit corresponds to SCellIndex16
SCellIndex31_24	B8_Type	opt	leftmost bit corresponds to SCellIndex31, rightmost bit corresponds to SCellIndex24

NR_MAC_CE_AD_ServCellId_BwpId_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_AD_ServCellId_BwpId_Type**		
Comment	Common definition for first octet of CEs defined in TS 38.321 clause 6.1.3.12 .. TS 38.321 clause 6.1.3.19		
AD	B1_Type		A/D field for NR_MAC_CE_SP_ResourceSetActDeact_Type and NR_MAC_CE_SP_SRS_ActDeact_Type reserved (set to 0) otherwise
ServCellId	B5_Type		identity of the Serving Cell for which the MAC CE applies
BwpId	B2_Type		BWP-Id (as specified in TS 38.331) of the uplink/downlink bandwidth part for which the MAC CE applies

D.2.1.1.2.2   MAC_ControlElement_BSR

TS 38.321 clause 6.1.3.1 (Buffer Status Report MAC CEs)

MAC_ControlElement_BSR: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_LongBSR_BufferSize_Type	O1_Type	

NR_MAC_CE_ShortBSR_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_ShortBSR_Type**		
Comment	Short BSR and Short Truncated BSR MAC CE according to TS 38.321 Figure 6.1.3.1-1		
LCG	B3_Type		
BufferSize	B5_Type		

NR_MAC_LongBSR_BufferSizeList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_LongBSR_BufferSizeList_Type**
Comment	
record length (1..8) of NR_MAC_LongBSR_BufferSize_Type	

NR_MAC_CE_LongBSR_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_LongBSR_Type**		
Comment	Long BSR and Long Truncated BSR MAC CE according to TS 38.321 Figure 6.1.3.1-2		
LCG_Presence	B8_Type		'1' indicates that the Buffer Size field for a logical channel group i is reported, with i = 7 for the leftmost bit and i = 0 for the rightmost
BufferSizeList	NR_MAC_LongBSR_BufferSizeList_Type		According to TS 38.321 clause 6.1.3.1 the Buffer Size fields are included in ascending order based on the LCGi

D.2.1.1.2.3   MAC_ControlElement_ContentionResolutionId

TS 38.321 clause 6.1.3.3 (UE Contention Resolution Identity MAC CE)

MAC_ControlElement_ContentionResolutionId: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_ContentionResolutionId_Type	B48_Type	TS 38.321 Figure 6.1.3.3-1; fix size of 48 bits

D.2.1.1.2.4 MAC_ControlElement_TimingAdvance

TS 38.321 clause 6.1.3.4 (Timing Advance Command MAC CE)

NR_MAC_CE_TimingAdvance_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TimingAdvance_Type**		
Comment	TS 38.321 Figure 6.1.3.4-1		
TAG_ID	B2_Type		TAG Identity of the addressed TAG
TimingAdvance Command	B6_Type		index value TA (0..63) used to control the amount of timing adjustment that MAC entity has to apply (as specified in TS 38.213)

D.2.1.1.2.5 MAC_ControlElement_PHR

TS 38.321 clause 6.1.3.8 (Single Entry PHR) and 6.1.3.9 (Multiple Entry PHR)

MAC_ControlElement_PHR: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_SingleEntry PHR_Type	NR_MAC_CE_PH_Record_Type	TS 38.321 Figure 6.1.3.8-1

NR_MAC_CE_PH_Record_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_PH_Record_Type**		
Comment			
P_Bit	B1_Type		P bit: 1 indicates the UE applies power backoff due to power management; reserved (R = '0'B) for Single Entry PHR MAC CE
V_Bit	B1_Type		V bit: Indicates when the PH value is based on a real transmission or a reference format; reserved (R = '0'B) for Single Entry PHR MAC CE
Value	B6_Type		The power headroom level. Ph Type 2 (if configured) for Pcell and Type 1 for Pcell and Scell
Reserved	B2_Type	opt	2 reserved bits; present if V=1
PCMaxc	B6_Type	opt	present if V=1

NR_MAC_CE_MultiEntryPHR_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_MultiEntryPHR_Type**		
Comment	TS 38.321 Figure 6.1.3.9-1 and Figure 6.1.3.9-2		
PHFieldPresent ForSCell	NR_MAC_CE_SCellFlags_ Type		to indicate presence of PH field for particular SCell
PH_Record	record of NR_MAC_CE_PH_Record_ Type		list of PH_Records for PCell and SCells as described in TS 38.321 clause 6.1.3.9

D.2.1.1.2.6 MAC_ControlElement_SCellActivationDeactivation

TS 38.321 clause 6.1.3.10 (SCell Activation/Deactivation MAC CEs)

MAC_ControlElement_SCellActivationDeactivation: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_SCellActDe act_Type	NR_MAC_CE_SCellFlags_Type	TS 38.321 Figure 6.1.3.10-1 and Figure 6.1.3.10-2

D.2.1.1.2.7 MAC_ControlElement_DuplicationActivationDeactivation

TS 38.321 clause 6.1.3.11 (Duplication Activation/Deactivation MAC CE)

MAC_ControlElement_DuplicationActivationDeactivation: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_Duplication ActDeact_Type	B8_Type	TS 38.321 Figure 6.1.3.11-1

D.2.1.1.2.8 MAC_ControlElement_SP_ResourceSetActivationDeactivation

TS 38.321 clause 6.1.3.12 (SP CSI-RS / CSI-IM Resource Set Activation/Deactivation MAC CE)

NR_MAC_CE_SP_ResourceSetActDeact_Octet2_Type

TTCN-3 Record Type			
Name	NR_MAC_CE_SP_ResourceSetActDeact_Octet2_Type		
Comment			
Reserved	B3_Type		
IM	B1_Type		indicates whether or not octet 3 is present
CSI_RS_Reso urcesetId	B4_Type		

NR_MAC_CE_SP_ResourceSetActDeact_Octet3_Type

TTCN-3 Record Type			
Name	NR_MAC_CE_SP_ResourceSetActDeact_Octet3_Type		
Comment			
Reserved	B4_Type		
CSI_IM_Resou rcesetId	B4_Type		

NR_MAC_CE_SP_ResourceSetActDeact_TciStateId_Type

TTCN-3 Record Type			
Name	NR_MAC_CE_SP_ResourceSetActDeact_TciStateId_Type		
Comment			
Reserved	B2_Type		
Id	B6_Type		

NR_MAC_CE_SP_ResourceSetActDeact_TciStateIdList_Type

TTCN-3 Record of Type	
Name	NR_MAC_CE_SP_ResourceSetActDeact_TciStateIdList_Type
Comment	
record of NR_MAC_CE_SP_ResourceSetActDeact_TciStateId_TypeeId_Type	

NR_MAC_CE_SP_ResourceSetActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ResourceSetActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.12-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		
Octet2	NR_MAC_CE_SP_Resourc eSetActDeact_Octet2_Type		
Octet3	NR_MAC_CE_SP_Resourc eSetActDeact_Octet3_Type	opt	present if IM=1 in octet 2
IdList	NR_MAC_CE_SP_Resourc eSetActDeact_TciStateIdLis t_Type		

D.2.1.1.2.9   MAC_ControlElement_CSI_TriggerStateSubselection

TS 38.321 clause 6.1.3.13 (Aperiodic CSI Trigger State Subselection MAC CE)

NR_MAC_CE_CSI_TriggerStateSubselection_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_CSI_TriggerStateSubselection_Type**		
Comment	TS 38.321 Figure 6.1.3.13-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		A/D field: reserved
Selection	B8_List_Type		

D.2.1.1.2.10   MAC_ControlElement_TCI_StatesActivationDeactivation

TS 38.321 clause 6.1.3.14 (TCI States Activation/Deactivation for UE-specific PDSCH MAC CE)

NR_MAC_CE_TCI_StatesActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TCI_StatesActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.14-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		A/D field: reserved
Status	B8_List_Type		

D.2.1.1.2.11   MAC_ControlElement_TCI_StateIndication

TS 38.321 clause 6.1.3.15 (TCI State Indication for UE-specific PDCCH MAC CE)

NR_MAC_CE_TCI_StateIndication_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TCI_StateIndication_Octet2_Type**		
Comment			
CoresetId	B2_Type		
TciStateId	B6_Type		

NR_MAC_CE_TCI_StateIndication_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TCI_StateIndication_Type**		
Comment	TS 38.321 Figure 6.1.3.15-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		A/D field: reserved
Octet2	NR_MAC_CE_TCI_StateIn dication_Octet2_Type		

D.2.1.1.2.12 MAC_ControlElement_SP_CSI_ReportingActivationDeactivation

TS 38.321 clause 6.1.3.16 (SP CSI reporting on PUCCH Activation/Deactivation MAC CE)

NR_MAC_CE_SP_CSI_ReportingActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_CSI_ReportingActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.16-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		A/D field: reserved
ConfigState	B8_Type		

D.2.1.1.2.13 MAC_ControlElement_SP_SRS_ActivationDeactivation

NR_MAC_CE_SP_SRS_ActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_Octet2_Type**		
Comment	TS 38.321 clause 6.1.3.17 (SP SRS Activation/Deactivation MAC CE)		
Reserved	B3_Type		
SUL	B1_Type		
SRS_Resource setId	B4_Type		

NR_MAC_CE_SP_SRS_ActDeact_ResourceId_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_ResourceId_Type**		
Comment			
F	B1_Type		
Id	B7_Type		

NR_MAC_CE_SP_SRS_ActDeact_ResourceIdList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_CE_SP_SRS_ActDeact_ResourceIdList_Type**
Comment	
record of NR_MAC_CE_SP_SRS_ActDeact_ResourceId_Typee	

NR_MAC_CE_SP_SRS_ActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.17-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		
Octet2	NR_MAC_CE_SP_SRS_Ac tDeact_Octet2_Type		
ResourceIdList	NR_MAC_CE_SP_SRS_Ac tDeact_ResourceIdList_Typ e		

D.2.1.1.2.14   MAC_ControlElement_PUCCH_SpatialRelationActivationDeactivation

TS 38.321 clause 6.1.3.18 (PUCCH spatial relation Activation/Deactivation MAC CE)

NR_MAC_CE_PUCCH_SpatialRelationActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_PUCCH_SpatialRelationActDeact_Octet2_Type**		
Comment			
Reserved	B1_Type		
ResourceId	B7_Type		

NR_MAC_CE_PUCCH_SpatialRelationActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_PUCCH_SpatialRelationActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.18-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		A/D field: reserved
Octet2	NR_MAC_CE_PUCCH_Sp atialRelationActDeact_Octe t2_Type		
ActivationStatu s	B8_Type		

D.2.1.1.2.15   MAC_ControlElement_ZP_ResourceSetActivationDeactivation

TS 38.321 clause 6.1.3.19 (SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE)

NR_MAC_CE_SP_ZP_ResourceSetActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ZP_ResourceSetActDeact_Octet2_Type**		
Comment			
Reserved	B4_Type		
Id	B4_Type		

NR_MAC_CE_SP_ZP_ResourceSetActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ZP_ResourceSetActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.19-1		
Octet1	NR_MAC_CE_AD_ServCell Id_BwpId_Type		A/D field: reserved
Octet2	NR_MAC_CE_SP_ZP_Res ourceSetActDeact_Octet2_ Type		

D.2.1.2   RLC_PDU

RLC_PDU: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_SDU_Type	octetstring	

NR_RLC_PDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_PDU_Type**	
Comment		
TMD	NR_RLC_TMD_PDU_Type	
UMD	NR_RLC_UMD_PDU_Type	
AMD	NR_RLC_AMD_PDU_Type	
Status	NR_RLC_AM_StatusPDU_Type	

NR_RLC_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_RLC_PDUList_Type**
Comment	
record of NR_RLC_PDU_Type	

NR_RLC_SDUList_Type

TTCN-3 Record of Type	
Name	**NR_RLC_SDUList_Type**
Comment	
record of NR_RLC_SDU_Type	

D.2.1.2.1   Common

RLC PDU definition: common AM/UM field definitions

Common: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_SegmentationInfo_Type	B2_Type	Segmentation Info (SI) field (TS 38.322, clause 6.2.3.4) 00 - Data field contains all bytes of an RLC SDU 01 - Data field contains the first segment of an RLC SDU 10 - Data field contains the last segment of an RLC SDU 11 - Data field contains neither the first nor last segment of an RLC SDU
NR_RLC_SegmentOffset_Type	B16_Type	Segment Offset (SO) field (TS 38.322, 6.2.3.5)

D.2.1.2.2   TM_Data

RLC PDU definition: UM (TS 38.322, clause 6.2.2.2)

TM_Data: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_TMD_PDU_Type	octetstring	TS 38.322, clause 6.2.2.2

D.2.1.2.3 UM_Data

RLC PDU definition: UM (TS 38.322, clause 6.2.2.3)

UM_Data: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_UMD_Data_Type	octetstring	TS 38.322, clause 6.2.2.3

NR_RLC_UMD_HeaderSN6Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_HeaderSN6Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-1, 6.2.2.3-2, 6.2.2.3-4); one octet		
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
SequenceNumber	B6_Type		6 bits SN, in case of UMD PDU containing a complete RLC SDU all SN bits are reserved (see Figure 6.2.2.3-1)
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.3)

NR_RLC_UMD_PduSN6Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_PduSN6Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-1, 6.2.2.3-2, 6.2.2.3-4); one octet		
Header	NR_RLC_UMD_HeaderSN6Bit_Type		
Data	NR_RLC_UMD_Data_Type		

NR_RLC_UMD_HeaderSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_HeaderSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-3, 6.2.2.3-5); two octets		
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
Reserved	B2_Type		2 bits reserved
SequenceNumber	B12_Type		12 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.3)

NR_RLC_UMD_PduSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_PduSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-3, 6.2.2.3-5); two octets		
Header	NR_RLC_UMD_HeaderSN12Bit_Type		
Data	NR_RLC_UMD_Data_Type		

NR_RLC_UMD_PDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_UMD_PDU_Type**	
Comment		
SN6Bit	NR_RLC_UMD_PduSN6Bit_Type	
SN12Bit	NR_RLC_UMD_PduSN12Bit_Type	

D.2.1.2.4   AM_Data

RLC PDU definition: AM (TS 38.322, clause 6.2.2.4)

AM_Data: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_AMD_Data_Type	octetstring	TS 38.322, clause 6.2.2.4

NR_RLC_AMD_HeaderSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_HeaderSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 (Figure 6.2.2.4-1, 6.2.2.4-3)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Poll	B1_Type		1 bit, '0'B - Status report not requested '1'B - Status report is requested
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
SequenceNumber	B12_Type		12 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.4)

NR_RLC_AMD_PduSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_PduSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 (Figure 6.2.2.4-1, 6.2.2.4-3)		
Header	NR_RLC_AMD_HeaderSN12Bit_Type		
Data	NR_RLC_AMD_Data_Type		

NR_RLC_AMD_HeaderSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_HeaderSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 (Figure 6.2.2.4-2, 6.2.2.4-4)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Poll	B1_Type		1 bit, 0 - Status report not requested 1 - Status report is requested
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
Reserved	B2_Type		2 bits reserved
SequenceNumber	B18_Type		18 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.4)

NR_RLC_AMD_PduSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_PduSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 Figure 6.2.2.4-2, 6.2.2.4-4)		
Header	NR_RLC_AMD_HeaderSN18Bit_Type		
Data	NR_RLC_AMD_Data_Type		

NR_RLC_AMD_PDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_AMD_PDU_Type**	
Comment	TS 38.322, clause 6.2.2.4	
SN12Bit	NR_RLC_AMD_PduSN12Bit_Type	
SN18Bit	NR_RLC_AMD_PduSN18Bit_Type	

D.2.1.2.5   AM_Status

AM Status PDU (TS 36.322, clause 6.2.1.6)

AM_Status: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_Status_ExtensionBit1_Type	B1_Type	TS 38.322, clause 6.2.3.11 Extension bit 1 (E1) field: '0'B A set of NACK_SN, E1, E2 and E3 does not follow. '1'B A set of NACK_SN, E1, E2 and E3 follows.
NR_RLC_Status_ExtensionBit2_Type	B1_Type	TS 38.322, clause 6.2.3.13 Extension bit 2 (E2) field: '0'B A set of SOstart and SOend does not follow for this NACK_SN. '1'B A set of SOstart and SOend follows for this NACK_SN.
NR_RLC_Status_ExtensionBit3_Type	B1_Type	TS 38.322, clause 6.2.3.16 Extension bit 3 (E3) field: '0'B A set of NACK_SN, E1, E2 and E3 follows. '1'B NACK range field follows for this NACK_SN.

NR_RLC_Status_NackSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_Status_NackSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
SequenceNumberNACK	B12_Type		12 bits SN
E1	NR_RLC_Status_Extension Bit1_Type		1 bit E1 field; set if further NACK set follows
E2	NR_RLC_Status_Extension Bit2_Type		1 bit E2 field
E3	NR_RLC_Status_Extension Bit3_Type		1 bit E3 field
Reserved	B1_Type		1 bit reserved
SOstart	NR_RLC_SegmentOffset_Type	opt	segment offset (start), present only if E2 is set to '1'B
SOstop	NR_RLC_SegmentOffset_Type	opt	segment offset (stop), present only if E2 is set to '1'B
NACKrange	B8_Type	opt	NACK range, present only if E3 is set to '1'B

NR_RLC_Status_NackListSN12Bit_Type

TTCN-3 Record of Type	
Name	**NR_RLC_Status_NackListSN12Bit_Type**
Comment	
record of NR_RLC_Status_NackSN12Bit_Type	

NR_RLC_StatusPduSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_StatusPduSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
D_C	B1_Type		1 bit, '0'B for Control PDU
CPT	B3_Type		3 bits, TS 38.322, clause 6.2.3.9 Control PDU Type (CPT) field: '000'B STATUS PDU ELSE reserved
SequenceNumberACK	B12_Type		12 bits SN
E1	NR_RLC_Status_Extension Bit1_Type		1 bit E1 field
Reserved	B7_Type		7 bits reserved
NackList	NR_RLC_Status_NackListSN12Bit_Type	opt	zero or more sets of a NACK_SN, E1, E2 and E3 and possibly a pair of SOstart/SOend or NACK range field for each NACK_SN

NR_RLC_Status_NackSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_Status_NackSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
SequenceNumberNACK	B18_Type		18 bits SN
E1	NR_RLC_Status_Extension Bit1_Type		1 bit E1 field; set if further NACK set follows
E2	NR_RLC_Status_Extension Bit2_Type		1 bit E2 field
E3	NR_RLC_Status_Extension Bit3_Type		1 bit E3 field
Reserved	B3_Type		3 bits reserved
SOstart	NR_RLC_SegmentOffset_Type	opt	segment offset (start), present only if E2 is set to '1'B
SOstop	NR_RLC_SegmentOffset_Type	opt	segment offset (stop), present only if E2 is set to '1'B
NACKrange	B8_Type	opt	NACK range, present only if E3 is set to '1'B

NR_RLC_Status_NackListSN18Bit_Type

TTCN-3 Record of Type	
Name	**NR_RLC_Status_NackListSN18Bit_Type**
Comment	
record of NR_RLC_Status_NackSN18Bit_Type	

NR_RLC_StatusPduSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_StatusPduSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
D_C	B1_Type		1 bit, '0'B for Control PDU
CPT	B3_Type		3 bits, TS 38.322, clause 6.2.3.9 Control PDU Type (CPT) field: '000'B STATUS PDU ELSE reserved
SequenceNumberACK	B18_Type		18 bits SN
E1	NR_RLC_Status_Extension Bit1_Type		1 bit E1 field
Reserved	B1_Type		1 bit reserved
NackList	NR_RLC_Status_NackListSN18Bit_Type	opt	zero or more sets of a NACK_SN, E1, E2 and E3 and possibly a pair of SOstart/SOend or NACK range field for each NACK_SN

NR_RLC_AM_StatusPDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_AM_StatusPDU_Type**	
Comment	TS 38.322, clause 6.2.254	
SN12Bit	NR_RLC_StatusPduSN12Bit_Type	
SN18Bit	NR_RLC_StatusPduSN18Bit_Type	

D.2.1.3   SDAP

SDAP: Basic Type Definitions

TTCN-3 Basic Types		
NR_SDAP_SDU_Type	octetstring	

NR_SDAP_SDUList_Type

TTCN-3 Record of Type	
Name	**NR_SDAP_SDUList_Type**
Comment	
record of NR_SDAP_SDU_Type	

NR_SDAP_DataPduHeader

TTCN-3 Record Type			
Name	**NR_SDAP_DataPduHeader**		
Comment	TS 37.324 Figure 6.2.2.2-1		
RQI	B1_Type		TS 37.324 clause 6.3.4: The RQI bit indicates whether NAS and/or AS mapping rules need to be updated 1 bit: '0'B No action '1'B To inform NAS; and to update AS mapping rule, if needed
QFI	B7_Type		TS 37.324 clause 6.3.5: The QFI field indicates the ID of the QoS flow to which the SDAP SDU belongs

NR_SDAP_PDU_Type

TTCN-3 Record Type			
Name	**NR_SDAP_PDU_Type**		
Comment	TS 37.324 clause 6.2.2 Data PDU		
Header	NR_SDAP_DataPduHeader	opt	present for Data PDU with SDAP header (clause 6.2.2.2), omitted for Data PDU without SDAP header (clause 6.2.2.1)
Data	NR_SDAP_SDU_Type		

NR_SDAP_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_SDAP_PDUList_Type**
Comment	
record of NR_SDAP_PDU_Type	

D.2.2   DRB_Primitive_Definitions

Primitive definitions to send/receive data PDUs over DRB's

D.2.2.1 DRB_Common

NR_L2DataList_Type

TTCN-3 Union Type		
Name	**NR_L2DataList_Type**	
Comment	MAC: acc. to rel-15 protocols there is exactly one MAC PDU per TB but in case of spatial multiplexing there can be one or more TB per HARQ process; any MAC PDU is completely included in one slot (TTI) RLC: one or more RLC PDUs per slot (TTI) (e.g. RLC Data + Status PDU on a logical channel; more than one RLC Data PDU in one MAC PDU is valid too) any RLC PDU is completely included in one slot (TTI) PDCP: one or more PDUs per slot (TTI); one PDCP PDU may be included in more than one slot (TTI)	
MacPdu	NR_MAC_PDUList_Type	SS configuration: RLC TM mode, MAC no header removal (PDCP is not configured)
RlcPdu	NR_RLC_PDUList_Type	SS configuration: RLC TM mode, MAC header removal (PDCP is not configured)
RlcSdu	NR_RLC_SDUList_Type	SS configuration: RLC UM mode with no PDCP
PdcpPdu	NR_PDCP_PDUList_Type	SS configuration: RLC AM/UM mode, no handling of PDCP header
PdcpSdu	NR_PDCP_SDUList_Type	SS configuration: RLC AM/UM mode, PDCP normal mode (automatic handling of PDCP header)
SdapPdu	NR_SDAP_PDUList_Type	SS configuration: RLC AM/UM mode, PDCP normal mode (automatic handling of PDCP header), no handling of SDAP header
SdapSdu	NR_SDAP_SDUList_Type	SS configuration: RLC AM/UM mode, PDCP normal mode (automatic handling of PDCP header), automatic handling of SDAP header

NR_HarqProcessAssignment_Type

TTCN-3 Union Type		
Name	**NR_HarqProcessAssignment_Type**	
Comment	in DL the HARQ process id may be specified by the test case or automatically assigned by SS	
Id	NR_HarqProcessId_Type	HARQ process as specified by the test case NOTE1: the scope of this type is only for data being sent in one slot (TTI); if data needs more than one slot (TTI) the HarqProcessId is undefined for the 2nd TTI onward what shall be handled as an error at the SS; SS may send a SYSTEM_IND indicating an error in this case; NOTE2: The initial value of the NDI shall be the same for all HARQ processes and cells
Automatic	Null_Type	HARQ process id automatically assigned by SS

D.2.2.2 Downlink

NR_DRB_DataPerSlot_DL_Type

TTCN-3 Record Type			
Name	NR_DRB_DataPerSlot_DL_Type		
Comment	common definition for one or several PDUs/SDUs; in NR the DL data is sent in the slot given by the slot offset NOTE 1: For MAC and RLC PDUs a single PDU is always sent in one slot; SS shall raise an error indication (using SYSTEM_IND) when that is not possible NOTE 2: For PDCP the data may be spread over more than one slot (segmented by the RLC); the TTCN implementation is responsible to calculate appropriate offsets accordingly; the exact timing depends on (and is exactly specified by) configuration of the DL scheduling; SS shall raise an error when there is any conflict		
SlotOffset	integer		NR: Slot offset relative to the absolute timing information given in the common part of the ASP; NOTE: if a PDCP PDU or SDU takes more than one slot, SlotOffset specifies the first slot (TTI)
HarqProcess	NR_HarqProcessAssignment_Type	opt	HARQ process to be used: specific value or automatically assigned by SS; in automatic mode SS chooses HARQ process out of the set configured by CcchDcchDtchConfigDL_Type.HarqProcessConfig NOTE: for PDCP SDUs or PDUs automatic mode shall be used; otherwise SS shall raise an error
PduSduList	NR_L2DataList_Type		list of PDUs/SDUs to be sent in one slot (TTI)

NR_DRB_DataPerSlotList_DL_Type

TTCN-3 Record of Type		
Name	NR_DRB_DataPerSlotList_DL_Type	
Comment	list of user plane data to be sent in slots given by the SlotOffset in the single elements of the list; Timing: the start time for the whole sequence is given by the timing info of the ASP (common information); the timing for the respective data pdus is given by the SlotOffset relative to the common timing info; design consideration: repetitions of this sequence are not foreseen (in which case the slot offset could not be related to the timing info of the ASP)	
record of NR_DRB_DataPerSlot_DL_Type		

NR_L2Data_Request_Type

TTCN-3 Record Type			
Name	NR_L2Data_Request_Type		
Comment	NOTE: formal type definition to allow later enhancements		
SlotDataList	NR_DRB_DataPerSlotList_DL_Type		

D.2.2.3 Uplink

NR_DRB_DataPerSlot_UL_Type

TTCN-3 Record Type			
Name	**NR_DRB_DataPerSlot_UL_Type**		
Comment	common definition for one or several PDUs/SDUs being received in one slot or to receive one PDCP PDU or SDU being spread over more than one slot (TTI); NOTE: There is a fix relation between HARQ process id and slot in UL => it is not necessary to include HARQ process id for UL data		
PduSduList	NR_L2DataList_Type		list of PDUs/SDUs being received in one TTI; elements of the list appear in the same order as the PDUs/SDUs in the MAC PDU; for PDCP when a PDU or SDU takes more than one TTI the list only contains this PDU or SDU
NoOfTTIs	integer		in case of PDCP: number of TTIs the SDU or PDU has taken NOTE 1: for the time being the NoOfTTIs is not checked by TTCN-3 and may be set to 1 by SS; NOTE 2: the timing info in common part of the ASP refers to the last TTI NOTE 3: when NoOfTTIs > 1 => PduSduList shall only contain one PDCP PDU or SDU in case of MAC or RLC PDUs: NoOfTTIs shall always be 1

NR_L2Data_Indication_Type

TTCN-3 Record Type			
Name	**NR_L2Data_Indication_Type**		
Comment	NOTE: formal type definition to allow later enhancements; L2Data_Indication_Type defines data being received in a single slot i.e. PDUs of subsequent TTIs are indicated in separated ASPs		
SlotData	NR_DRB_DataPerSlot_UL_Type		

D.2.3 System_Interface

NR_DRB_COMMON_REQ

TTCN-3 Record Type			
Name	**NR_DRB_COMMON_REQ**		
Comment	common ASP to send PDUs to DRBs		

Common	NR_ReqAspCommonPart_Type		CellId : identifier of the cell
			RoutingInfo : DRB id
			TimingInfo : starting point when to start sending sequence of data PDUs
			  e.g.
			   SFN = X, subframe number = x; slot number = slot_i depending on numerology
			   U_Plane.SubframeDataList[i].SlotOffset := offset_i;
			  => U_Plane.SubframeDataList[0].PduSduList shall be sent out at (X, x, i)
			   U_Plane.SubframeDataList[i].PduSduList shall be sent out offset_i slots after U_Plane.SubframeDataList[0].PduSduList (depending on the numerology)
			ControlInfo : CnfFlag:=false; FollowOnFlag:=false

U_Plane	NR_L2Data_Request_Type		
SuppressPdcchForC_RNTI	Null_Type	opt	By default all DRB_COMMON_REQ scheduled DL PDU's are associated with an appropriate explicit configured or SS selected DL assignment allocation on PDCCH. For SuppressPdcch:=true in the sub frame in which DL PDU's are transmitted, there is no associated DL assignment allocation for configured C-RNTI. This will be used for SPS assignment based transmission or in any error scenarios; NOTE: this flag has no impact on PDCCH messages required for SPS activation

NR_DRB_COMMON_IND

TTCN-3 Record Type		
Name	**NR_DRB_COMMON_IND**	
Comment	common ASP to receive PDUs from DRBs	
Common	NR_IndAspCommonPart_Type	CellId : identifier of the cell RoutingInfo : DRB id TimingInfo : time when message has been received NOTE 1: For MAC and RCL PDUs per definition L2Data_Indication_Type corresponse to exactly one slot => TimingInfo refers to this slot NOTE 2: For PDCP a single PDU or SDU may take more than one TTI => TimingInfo refers to the end of the PDU/SDU and the length is given by NoOfTTIs in L2Data_Indication_Type (the end of the PDU/SDU is the last RLC PDU being received; in case of retransmissions this is not necessarily the RLC PDU with the last SN)
U_Plane	NR_L2Data_Indication_Type	

NR_DRB_PORT

TTCN-3 Port Type		
Name	**NR_DRB_PORT**	
Comment		
out	NR_DRB_COMMON_REQ	
in	NR_DRB_COMMON_IND	

D.3   NR_ASP_SrbDefs

D.3.1   SRB_DATA_ASPs

ASP Definitions to send/receive peer-to-peer messages on SRBs

SRB_DATA_ASPs: Basic Type Definitions

TTCN-3 Basic Types		
NR_NAS_MSG_RequestList_Type	Dummy_Type	place holder for ENDC
NR_NAS_MSG_IndicationList_Type	Dummy_Type	place holder for ENDC

NR_C_Plane_Request_Type

TTCN-3 Record Type			
Name	**NR_C_Plane_Request_Type**		
Comment	RRC and/or NAS PDU to be send to the UE; Note: it may be necessary to allow more than one NAS PDU (-> "record of")		
Rrc	NR_RRC_MSG_Request_Type	opt	omit: NAS message shall be present; NAS message shall be sent in DLInformationTransfer present: if NAS message is present also, (piggybacked) NAS PDU shall be security protected (if necessary) and inserted in RRC PDU's DedicatedInfoNAS
Nas	NR_NAS_MSG_RequestList_Type	opt	omit: RRC message shall be present; RRC message does not contain (piggybacked) NAS PDU present: if RRC message is omitted => NAS message shall be sent embedded in DLInformationTransfer if RRC message is present => NAS message is piggybacked in RRC message in case of RRC message is sent on CCCH, NAS message shall be omitted

NR_C_Plane_Indication_Type

TTCN-3 Record Type			
Name	**NR_C_Plane_Indication_Type**		
Comment	RRC and/or NAS PDU to be received from the UE; Note: it may be necessary to allow more than one NAS PDU (-> "record of")		
Rrc	NR_RRC_MSG_Indication_Type	opt	omit: NAS message shall be present; NAS message is received in ULInformationTransfer present: if NAS message is present also, DedicatedInfoNAS contains unstructured and ciphered NAS message and the NAS message is the deciphered message in structured format

Nas	NR_NAS_MSG_IndicationList_Type	opt	omit: RRC message shall be present; RRC message does not contain (piggybacked) NAS PDU
			present: if RRC message is omitted => NAS message has been received in ULInformationTransfer
			     if RRC message is present => NAS message has been piggybacked in RRC message
			NOTE:
			  even though currently (DEC 08 ASN.1) there is no RRC PDU in UL containing more than one
			     DedicatedInfoNAS we provide a list to allow extendability

NR_SRB_COMMON_REQ

TTCN-3 Record Type			
Name	**NR_SRB_COMMON_REQ**		
Comment	common ASP to send PDUs to SRB0, SRB1 or SRB2		

Common	NR_ReqAspCommonPart_Type		CellId identifier of the cell
			RoutingInfo SRB0, SRB1, SRB2, SRB3
			TimingInfo Now in normal cases;
			          For latency tests TimingInfo can be set to the SFN/subframe
			          in which the RRC messages shall be sent out (in this case and
			          if the RRC PDU is too long to be sent in one TTI
			          the TimingInfo corresponds to the first TTI)
			ControlInfo
			  CnfFlag:=false;
			  FollowOnFlag
			    true: Indicates that the message(s) to be sent on the same TTI will follow
			          NOTE 1: When FollowOnFlag is true, TimingInfo shall always be "Now". Otherwise SS shall produce an error
			          NOTE 2: the follow on flag applies only for messages of the same SRB
			    false: Indicates that no more message(s) will follow

Signalling	NR_C_Plane_Request_Type		

NR_SRB_COMMON_IND

TTCN-3 Record Type			
Name	**NR_SRB_COMMON_IND**		
Comment	common ASP to receive PDUs from SRB0, SRB1 or SRB2		
Common	NR_IndAspCommonPart_Type		CellId identifier of the cell RoutingInfo SRB0, SRB1, SRB2, SRB3 TimingInfo time when message has been received (as received from the SS by the NAS emulator)
Signalling	NR_C_Plane_Indication_Type		

D.3.2   Port_Definitions

NR_SRB_PORT

TTCN-3 Port Type		
Name	**NR_SRB_PORT**	
Comment	NR PTC: Port for Sending/Receiving data on SRBs	
out	NR_SRB_COMMON_REQ	
in	NR_SRB_COMMON_IND	

NASEMU_NR_SRB_PORT

TTCN-3 Port Type		
Name	**NASEMU_NR_SRB_PORT**	
Comment	NASEMU PTC: Port for Sending/Receiving data on SRBs (interface to NR PTC)	
out	NR_SRB_COMMON_IND	
in	NR_SRB_COMMON_REQ	

D.4 NR_CommonDefs

DL_CCCH_Message

TTCN-3 Record Type	
Name	**DL_CCCH_Message**
Comment	

UL_CCCH_Message

TTCN-3 Record Type	
Name	**UL_CCCH_Message**
Comment	

D.4.1 Common_Types

Common_Types: Basic Type Definitions

TTCN-3 Basic Types		
NR_HarqProcessId_Type	integer	HARQ process id; NOTE: there seems to be no need for any value restriction
NR_AbsoluteCellPower_Type	integer (-150..0)	absolute cell power (dBm)

NR_RRC_MSG_Request_Type

TTCN-3 Union Type		
Name	**NR_RRC_MSG_Request_Type**	
Comment	DL RRC PDU on CCCH or DCCH	
Ccch	DL_CCCH_Message	
Dcch	DL_DCCH_Message	

NR_RRC_MSG_Indication_Type

TTCN-3 Union Type		
Name	**NR_RRC_MSG_Indication_Type**	
Comment	UL RRC PDU on CCCH or DCCH	
Ccch	UL_CCCH_Message	
Dcch	UL_DCCH_Message	

NR_HarqProcessList_Type

TTCN-3 Record of Type	
Name	**NR_HarqProcessList_Type**
Comment	list of HARQ processes: each element shall be unique; NOTE: there seems to be no need for any length restriction
record of NR_HarqProcessId_Type	

D.4.2 RRC_Nested_Types

RRC_Nested_Types: Basic Type Definitions

TTCN-3 Basic Types		
NR_PrioritizedBitRate_Type	LogicalChannelConfig.ul_SpecificParameters.prioritisedBitRate	

D.4.3 ASP_CommonPart

Definition of ASP common parts for REQ-, CNF- and IND-ASPs

D.4.3.1 ASP_CommonPart_Definitions

D.4.3.1.1 Routing_Info

!!!! NR-NOTE: tsc_MaxRB as defined in EUTRA should not be needed as being used only to limit RadioBearerList_Type, SecurityActTimeList_Type and PdcpCountInfoList_Type and there seems to be no reason for any upper limit for these types !!!!

NR_RadioBearerId_Type

TTCN-3 Union Type		
Name	**NR_RadioBearerId_Type**	
Comment		
Srb	SRB_Identity_Type	
Drb	DRB_Identity	

NR_RoutingInfo_Type

TTCN-3 Union Type		
Name	**NR_RoutingInfo_Type**	
Comment		
None	Null_Type	
RadioBearerId	NR_RadioBearerId_Type	

D.4.3.2 REQ_ASP_CommonPart

NR_ReqAspCommonPart_Type

TTCN-3 Record Type			
Name	**NR_ReqAspCommonPart_Type**		
Comment			
CellId	NR_CellId_Type		
RoutingInfo	NR_RoutingInfo_Type		
RlcBearerRouting	DC_RlcBearerRouting_Type		
TimingInfo	TimingInfo_Type		
ControlInfo	ReqAspControlInfo_Type		

D.4.3.3 CNF_ASP_CommonPart

NR_CnfAspCommonPart_Type

TTCN-3 Record Type			
Name	**NR_CnfAspCommonPart_Type**		
Comment			
CellId	NR_CellId_Type		
RoutingInfo	NR_RoutingInfo_Type		
TimingInfo	TimingInfo_Type		
Result	ConfirmationResult_Type		

D.4.3.4 IND_ASP_CommonPart

NR_IndAspCommonPart_Type

TTCN-3 Record Type			
Name	**NR_IndAspCommonPart_Type**		
Comment			
CellId	NR_CellId_Type		
RoutingInfo	NR_RoutingInfo_Type		
RlcBearerRouting	DC_RlcBearerRouting_Type		
TimingInfo	TimingInfo_Type		
Status	IndicationStatus_Type		

D.5 NR_PDCP_TypeDefs

D.5.1 NR_PDCP_Config_Parameters

Parameters defined in or related to NR ASN.1 type PDCP-Config

NR_PDCP_SN_Size_Type

TTCN-3 Enumerated Type	
Name	**NR_PDCP_SN_Size_Type**
Comment	PDCP Sequence Number
PDCP_SNLength12	TS 38.323 clause 6.2.2.1 and clause 6.2.2.2
PDCP_SNLength18	TS 38.323 clause 6.2.2.3

NR_PDCP_DRB_HeaderCompression_Type

TTCN-3 Union Type	
Name	**NR_PDCP_DRB_HeaderCompression_Type**
Comment	place holder for header compression
None	Null_Type

NR_PDCP_DRB_Config_Parameters_Type

TTCN-3 Record Type			
Name	**NR_PDCP_DRB_Config_Parameters_Type**		
Comment	parameters corrsponding to NR ASN.1 PDCP-Config.drb; the following parameter are not included and may be added if needed: - integer DiscardTimer (timer value in milliseconds) - boolean StatusReportRequired - boolean OutOfOrderDelivery		
SN_SizeUL	NR_PDCP_SN_Size_Type		PDCP-Config.drb.pdcp-SN-SizeUL
SN_SizeDL	NR_PDCP_SN_Size_Type		PDCP-Config.drb.pdcp-SN-SizeDL
HeaderCompression	NR_PDCP_DRB_HeaderCompression_Type		PDCP-Config.drb.headerCompression
IntegrityProtectionEnabled	boolean		PDCP-Config.drb.integrityProtection

NR_PDCP_RB_Config_Parameters_Type

TTCN-3 Union Type		
Name	**NR_PDCP_RB_Config_Parameters_Type**	
Comment		
Srb	Null_Type	no SRB specific parameters in NR ASN.1 PDCP-Config
Drb	NR_PDCP_DRB_Config_Parameters_Type	DRB specific parameters corrsponding to NR ASN.1 PDCP-Config.drb

NR_PDCP_Config_Parameters_Type

TTCN-3 Record Type			
Name	**NR_PDCP_Config_Parameters_Type**		
Comment	parameters corrsponding to NR ASN.1 PDCP-Config: the following parameter are not included and may be added if needed: - integer TReorderingTimer (timer value in milliseconds)		
Rb	NR_PDCP_RB_Config_Parameters_Type		

D.5.2   NR_PDCP_Configuration

NR_PDCP_TestModeInfo_Type

TTCN-3 Record Type	
Name	**NR_PDCP_TestModeInfo_Type**
Comment	!!!! NR-FFS: what kind of test mode do we need ?? !!!! !!!! Do we need any ROHC mode (see discussions about NBIOT) ?? !!!!

NR_PDCP_TestModeConfig_Type

TTCN-3 Union Type		
Name	**NR_PDCP_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	NR_PDCP_TestModeInfo_Type	

NR_PDCP_RbConfig_Type

TTCN-3 Union Type		
Name	**NR_PDCP_RbConfig_Type**	
Comment		
Params	NR_PDCP_Config_Parameters_Type	PDCP configuration parameters corresponding to UE configuration
Transparent	Null_Type	used for PDCP tests (TS 38.523-3, !!!! NR-TBD: reference to be added !!!!): the SS does not apply ciphering and does not maintain PDCP sequence numbers and state variables; in UL the PDCP PDUs are decoded acc. to the TestMode; Note: a reconfiguration of a RB from transparent mode to 'normal' mode is not foreseen (i.e. there is no mechanism to restore Ciphering, PDCP sequence numbers and state variables at the SS)

NR_PDCP_RBTerminating_Type

TTCN-3 Record Type			
Name	**NR_PDCP_RBTerminating_Type**		
Comment			
Rb	NR_PDCP_RbConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	NR_PDCP_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
LinkToOtherCellGroup	DC_RlcBearerRouting_Type	opt	mandatory for initial configuration; omit means "keep as it is" None: no link to other cell group (normal case, non-split bearer) RAT/cellId: PDCP is linked to RLC bearer of another cell group (same or other RAT): split bearer, MN-terminated SCG bearer, SN-terminated MCG bearer NOTE: applicable also for PDCP split bearer test cases when PDCP is in transparent mode => test case body may be implemented at one PTC
LinkToLocalCellGroup	boolean	opt	mandatory for initial configuration; omit means "keep as it is" true: PDCP is linked to the RLC bearer of the bearer terminating node's cell group: normal case, split bearer; false: PDCP is not linked to the RLC bearer of the bearer terminating node's cell group: e.g. MN-terminated SCG bearer, SN-terminated MCG bearer

NR_PDCP_Proxy_Type

TTCN-3 Record Type		
Name	**NR_PDCP_Proxy_Type**	
Comment	proxy to route PDCP data between terminating PDCP entity and RLC bearer of another cell (group)	
LinkToOtherNode	DC_RlcBearerRouting_Type	RAT/cellId to address the radio bearer terminating node (PDCP) (None is not applicable)

NR_PDCP_Configuration_Type

TTCN-3 Union Type		
Name	**NR_PDCP_Configuration_Type**	
Comment		
None	Null_Type	for SRB0 no PDCP is configured; furthermore the PDCP may not be configured e.g. for DRBs tested in RLC or MAC test cases
RBTerminating	NR_PDCP_RBTerminating_Type	PDCP entity at the terminating node: handling of PDCP protocol for the given bearer (normal or split beaerer)
Proxy	NR_PDCP_Proxy_Type	proxy to be configured above RLC instead of a normal PDCP entity when the RLC bearer is not in the same cell (group) as the terminating PDCP entity

D.5.3   NR_PDCP_DrbDefs

NR_PDCP_DrbDefs: Basic Type Definitions

TTCN-3 Basic Types		
NR_PDCP_SDU_Type	octetstring	
NR_PDCP_CtrlPduType_Type	B3_Type	PDU type according to TS 38.323 clause 6.3.8: 000 PDCP status report 001 Interspersed ROHC feedback 010-111 Reserved

NR_PDCP_SDUList_Type

TTCN-3 Record of Type	
Name	**NR_PDCP_SDUList_Type**
Comment	
record of NR_PDCP_SDU_Type	

NR_PDCP_DataPduSN12Bits_Type

TTCN-3 Record Type			
Name	**NR_PDCP_DataPduSN12Bits_Type**		
Comment	Data PDU for DRBs with 12 bits PDCP SN (TS 38.323, clause 6.2.2.2)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Reserved	B3_Type		3 bits reserved
SequenceNumber	B12_Type		12 bits sequence number
SDU	NR_PDCP_SDU_Type		content (octetstring)
MAC_I	B32_Type	opt	message authentication code according to TS 38.323, clause 6.3.4; MAC-I field is present only when the DRB is configured with integrity protection

NR_PDCP_DataPduSN18Bits_Type

TTCN-3 Record Type			
Name	**NR_PDCP_DataPduSN18Bits_Type**		
Comment	Data PDU for DRBs with 18 bits PDCP SN (TS 38.323, clause 6.2.2.3)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Reserved	B5_Type		5 bits reserved
SequenceNumber	B18_Type		18 bits sequence number
SDU	NR_PDCP_SDU_Type		content (octetstring)
MAC_I	B32_Type	opt	message authentication code according to TS 38.323, clause 6.3.4; MAC-I field is present only when the DRB is configured with integrity protection

NR_PDCP_CtrlPduStatus_Type

TTCN-3 Record Type			
Name	**NR_PDCP_CtrlPduStatus_Type**		
Comment	Control PDU for PDCP status report (TS 38.323, clause 6.2.3.1)		
D_C	B1_Type		1 bit, '0'B for Ctrl PDU
PDU_Type	NR_PDCP_CtrlPduType_Type		3 bits, '000'B for PDCP status report
Reserved	B4_Type		4 bits reserved
FirstMissingCount	B32_Type		32 bits, TS 38.323, clause 6.3.9 FMC
Bitmap	octetstring	opt	Bitmap according to TS 38.323, clause 6.3.10

NR_PDCP_CtrlPduRohcFeedback_Type

TTCN-3 Record Type			
Name	**NR_PDCP_CtrlPduRohcFeedback_Type**		
Comment	Control PDU for Interspersed ROHC feedback (TS 38.323, clause 6.2.3.2)		
D_C	B1_Type		1 bit, '0'B for Ctrl PDU
PDU_Type	NR_PDCP_CtrlPduType_Type		3 bits, '001'B for Interspersed ROHC feedback
Reserved	B4_Type		4 bits reserved
RohcFeedback	octetstring		ROHC packet that is not associated with a PDCP SDU

NR_PDCP_PDU_Type

TTCN-3 Union Type		
Name	**NR_PDCP_PDU_Type**	
Comment		
DataPduSN12 Bits	NR_PDCP_DataPduSN12Bits_Type	
DataPduSN18 Bits	NR_PDCP_DataPduSN18Bits_Type	
CtrlPduStatus	NR_PDCP_CtrlPduStatus_Type	
CtrlPduRohcFeedback	NR_PDCP_CtrlPduRohcFeedback_Type	

NR_PDCP_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_PDCP_PDUList_Type**
Comment	
record of NR_PDCP_PDU_Type	

D.7   CommonDefs

CommonDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_UInt16Max	integer	65535	

CommonDefs: Basic Type Definitions

TTCN-3 Basic Types		
B1_Type	bitstring length(1)	
B2_Type	bitstring length(2)	
B3_Type	bitstring length(3)	
B4_Type	bitstring length(4)	
B5_Type	bitstring length(5)	
B6_Type	bitstring length(6)	
B7_Type	bitstring length(7)	
B8_Type	bitstring length(8)	
B12_Type	bitstring length(12)	
B16_Type	bitstring length(16)	
B18_Type	bitstring length(18)	
B32_Type	bitstring length(32)	
B48_Type	bitstring length(48)	
B128_Type	bitstring length(128)	
B128_Key_Type	B128_Type	128 bit security key
O1_Type	octetstring length(1)	
Null_Type	boolean (true)	dummy type for 'typeless' fields in unions
Dummy_Type	boolean (true)	dummy type for temporary purposes only
UInt_Type	integer (0 .. infinity)	
UInt16_Type	integer (0 .. tsc_UInt16Max)	
PdcpCountValue_Type	B32_Type	
RNTI_Value_Type	UInt16_Type	corresponds to NR ASN.1: RNTI-Value ::= INTEGER (0..65535)
RNTI_B16_Type	B16_Type	

B8_List_Type

TTCN-3 Record of Type	
Name	**B8_List_Type**
Comment	
record of B8_Type	

IndicationAndControlMode_Type

TTCN-3 Enumerated Type	
Name	**IndicationAndControlMode_Type**
Comment	
enable	
disable	

NR_CellId_Type

TTCN-3 Enumerated Type	
Name	**NR_CellId_Type**
Comment	
nr_Cell_NonSpecific	
nr_Cell1	
nr_Cell2	
nr_Cell3	
nr_Cell4	
nr_Cell6	
nr_Cell10	
nr_Cell11	
nr_Cell12	
nr_Cell13	
nr_Cell14	
nr_Cell23	
nr_Cell28	
nr_Cell29	
nr_Cell30	
nr_Cell31	

NR_CellIdList_Type

TTCN-3 Record of Type	
Name	**NR_CellIdList_Type**
Comment	NOTE: there seems to be no need for any length restriction
record of NR_CellId_Type	

EUTRA_CellId_Type

TTCN-3 Enumerated Type	
Name	**EUTRA_CellId_Type**
Comment	
eutra_Cell_NonSpecific	
eutra_Cell1	
eutra_Cell2	
eutra_Cell3	
eutra_Cell4	
eutra_Cell6	
eutra_Cell10	
eutra_Cell11	
eutra_Cell12	
eutra_Cell13	
eutra_Cell14	
eutra_Cell23	
eutra_Cell28	
eutra_Cell29	
eutra_Cell30	
eutra_Cell31	
eutra_CellA	
eutra_CellB	
eutra_CellC	
eutra_CellD	
eutra_CellE	
eutra_CellG	
eutra_CellH	
eutra_CellI	
eutra_CellJ	
eutra_CellK	
eutra_CellL	
eutra_CellM	

D.8 CommonAspDefs

D.8.1 Cell_Configuration_Common

CellTimingInfo_Type

TTCN-3 Record Type			
Name	**CellTimingInfo_Type**		
Comment	Cell Timing		
TcOffset	integer (0..63)	opt	For NR according to TS 38.211 clause 4.1 Ts/Tc = 64 with Tc = 1/(480000 * 4096) and Ts = 1/(15000 * 2048) as for EUTRA; => for NR to specify granularity per Tc; for EUTRA to be set to 0 (and/or to be ignored by the SS)
Tcell	integer (0..307199)		frame duration Tf = 307200 * Ts = 10ms; System Time Unit Ts = 1/(15000 * 2048)
SfnOffset	integer (0..1023)		
HsfnOffset	integer (0..1023)		

D.8.2   MAC_Layer

ULGrant_Period_Type

TTCN-3 Union Type		
Name	**ULGrant_Period_Type**	
Comment		
OnlyOnce	Null_Type	grant is sent out only once; no period
Duration	integer (1..infinity)	duration of the grant period in number of sub-frames (1ms)

TransmissionRepetition_Type

TTCN-3 Union Type		
Name	**TransmissionRepetition_Type**	
Comment		
Continuous	Null_Type	
NumOfCycles	integer (1..infinity)	

PeriodicGrant_Type

TTCN-3 Record Type			
Name	**PeriodicGrant_Type**		
Comment			
Period	ULGrant_Period_Type		time period after which UL Grant need to be automatically transmitted or 'OnlyOnce'
NoOfRepetitions	TransmissionRepetition_Type		number of UL Grant repetitions to be automatically transmitted or continuous repetition

UL_GrantConfig_Type

TTCN-3 Union Type		
Name	**UL_GrantConfig_Type**	
Comment		
OnSR_Reception	Null_Type	SS tranmits UL Grant as configured by CommonDciInfoUL_Type at every reception of SR; to be used in non L2 Test
Periodic	PeriodicGrant_Type	SS tranmits UL Grant as configured by CommonDciInfoUL_Type periodically; to be used in L2 tests; MAC tests testing Grants might set the period as infinite and num grant as 1
PeriodicOnSR_Reception	PeriodicGrant_Type	SS tranmits UL Grant as configured by CommonDciInfoUL_Type periodically; the periodic grant transmission is started/restarted on reception of a SR from UE to be used in non L2 Test to enable large UL data transmission for lower category UEs (Cat<=1)
None	Null_Type	disable any grant transmission

RAR_RapIdCtrl_Type

TTCN-3 Union Type		
Name	**RAR_RapIdCtrl_Type**	
Comment		
Automatic	Null_Type	SS shall automatically use same RAPID as received from the UE
Unmatched	Null_Type	SS shall use RAPID being different from preamble sent by the UE; SS shall calculate this RAPID acc. to RAPID := (RAPID + 3..63) mod 64 if single RAR is transmitted in a MAC PDU then only 3 is added if multiple RAR's are transmitted in MAC PDU, then for first unmatched RAR 3 is added, second unmatched 4 is added, third unmatched 5 is added and so on

D.8.3   System_Indications

CommonAspDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_MaxHarqRetransmission	integer	28	maximum value for maxHARQ-Msg3Tx as being signalled to the UE

HARQ_Type

TTCN-3 Enumerated Type	
Name	**HARQ_Type**
Comment	ack represents HARQ ACK; nack represents HARQ NACK
ack	
nack	

HARQ_ModeList_Type

TTCN-3 Record of Type	
Name	**HARQ_ModeList_Type**
Comment	
record length (1..tsc_MaxHarqRetransmission) of HARQ_Type	

D.8.4   ASP_CommonPart

Definition of ASP common parts for REQ-, CNF- and IND-ASPs

D.8.4.1   ASP_CommonPart_Definitions

D.8.4.1.1   Routing_Info

CommonAspDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_SRB0	integer	0	
tsc_SRB1	integer	1	
tsc_SRB2	integer	2	
tsc_SRB3	integer	3	

Routing_Info: Basic Type Definitions

TTCN-3 Basic Types		
SRB_Identity_Type	integer (tsc_SRB0, tsc_SRB1, tsc_SRB2, tsc_SRB3)	

DC_RlcBearerRouting_Type

TTCN-3 Union Type		
Name	**DC_RlcBearerRouting_Type**	
Comment	data routing e.g. in case of split bearer (split DRB or split SRB); applicable for multi-RAT Dual Connectivity (MR-DC) as well as single-RAT Dual Connectivity	
EUTRA	EUTRA_CellId_Type	
NR	NR_CellId_Type	
None	Null_Type	normal case: PDCP and RLC are configured at the same cell

D.8.4.1.2   Timing_Info

Timing_Info: Basic Type Definitions

TTCN-3 Basic Types		
SystemFrameNumber_Type	integer (0..1023)	
SubFrameNumber_Type	integer (0..9)	
HyperSystemFrameNumberInfo_Type	SystemFrameNumberInfo_Type	

SubFrameInfo_Type

TTCN-3 Union Type		
Name	**SubFrameInfo_Type**	
Comment		
Number	SubFrameNumber_Type	
Any	Null_Type	no specific sub-frame (valid for REQ ASPs only)

SystemFrameNumberInfo_Type

TTCN-3 Union Type		
Name	**SystemFrameNumberInfo_Type**	
Comment		
Number	SystemFrameNumber_Type	
Any	Null_Type	no specific frame number (valid for REQ ASPs only)

SlotOffset_Type

TTCN-3 Union Type		
Name	**SlotOffset_Type**	
Comment	slots per subframe according to TS 38.211 Table 4.3.2-1	
Numerology0	Null_Type	mu=0; only one slot per subframe
Numerology1	integer (0..1)	mu=1; 2 slots per subframe
Numerology2	integer (0..3)	mu=2; 4 slots per subframe
Numerology3	integer (0..7)	mu=3; 8 slots per subframe
Numerology4	integer (0..15)	mu=4; 16 slots per subframe
Numerology5	integer (0..31)	mu=5; 32 slots per subframe

SlotTimingInfo_Type

TTCN-3 Union Type		
Name	**SlotTimingInfo_Type**	
Comment	EUTRA, NBIOT: REQ ASPs: TTCN shall set the SlotTimingInfo to "FirstSlot" for EUTRA, NBIOT IND ASPs: TTCN shall ignore the SlotTimingInfo sent by the SS for EUTRA, NBIOT NR: REQ ASPs: Any:=true only if the slot number is not relevant; SS may choose the next available slot of the given subframe IND ASPs: Any:=true only if there is no slot information available for the particular kind of indication	
SlotOffset	SlotOffset_Type	to address a particular slot in a sub-frame
FirstSlot	Null_Type	to address the first slot independent from the numerology (REQ ASPs only)
Any	Null_Type	for EUTRA, NBIOT or if slot number is not relevant or not available

SubFrameTiming_Type

TTCN-3 Record Type			
Name	**SubFrameTiming_Type**		
Comment			
SFN	SystemFrameNumberInfo_Type		
Subframe	SubFrameInfo_Type		
HSFN	HyperSystemFrameNumberInfo_Type		
Slot	SlotTimingInfo_Type		

TimingInfo_Type

TTCN-3 Union Type		
Name	**TimingInfo_Type**	
Comment		
SubFrame	SubFrameTiming_Type	
Now	Null_Type	to be used in REQ ASPs when there is no 'activation time'
None	Null_Type	only to be used in SYSTEM_CTRL_CNF or NR_SYSTEM_CTRL_CNF but not for EnquireTiming

D.8.4.2 REQ_ASP_CommonPart

ReqAspControlInfo_Type

TTCN-3 Record Type			
Name	**ReqAspControlInfo_Type**		
Comment			
CnfFlag	boolean		true => SS shall send CNF: when the REQ is with no timing information (no activation time), SS shall send the confirmation when the configuration is done, i.e. when the test case may continue. Example: when there is a configuration followed by a send event it shall not be necessary to have a wait timer in between but the CNF triggers the send event. If there are other triggers e.g. like the UE sending a message, CnfFlag shall be set to false by the test case to avoid racing conditions with the CNF and the signalling message. When there is an activation time SS shall send the CNF after the configuration has been scheduled; that means SS shall not wait until the activation time has been expired.
FollowOnFlag	boolean		false => no further (related) information true: further related information will be sent to SS (semantics depending on respective ASP)

D.8.4.3 CNF_ASP_CommonPart

ConfirmationResult_Type

TTCN-3 Union Type		
Name	**ConfirmationResult_Type**	
Comment		
Success	Null_Type	
Error	integer	may contain SS specific error code; this will not be evaluated by TTCN

D.8.4.4 IND_ASP_CommonPart

IntegrityErrorIndication_Type

TTCN-3 Record Type			
Name	**IntegrityErrorIndication_Type**		
Comment			
Nas	boolean		NAS Integrity: set to true when received MAC does not match calculated MAC
Pdcp	boolean		PDCP Integrity: set to true when received MAC does not match calculated MAC

ErrorIndication_Type

TTCN-3 Record Type			
Name	**ErrorIndication_Type**		
Comment			
Integrity	IntegrityErrorIndication_Type		Integrity error: received MAC does not match calculated MAC
System	integer		any other error: may be SS specific error code; this will not be evaluated by TTCN; e.g. an error shall be raised when the UE requests retransmission of an RLC PDU

IndicationStatus_Type

TTCN-3 Union Type		
Name	**IndicationStatus_Type**	
Comment		
Ok	Null_Type	
Error	ErrorIndication_Type	

D.9 References to TTCN-3

References to TTCN-3		
NR_ASP_TypeDefs	NR_Defs/NR_ASP_TypeDefs.ttcn	Rev 21282
NR_ASP_DrbDefs	NR_Defs/NR_ASP_DrbDefs.ttcn	Rev 21282
NR_ASP_SrbDefs	NR_Defs/NR_ASP_SrbDefs.ttcn	Rev 21118
NR_CommonDefs	NR_Defs/NR_CommonDefs.ttcn	Rev 21282
NR_PDCP_TypeDefs	Common4G5G/NR_PDCP_TypeDefs.ttcn	Rev 21275
Common4G5G	Common4G5G/Common4G5G.ttcn	Rev 21204
CommonDefs	Common/CommonDefs.ttcn	Rev 21282
CommonAspDefs	Common/CommonAspDefs.ttcn	Rev 21282

Annex E (informative):
Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-08	R5#76	R5-174121	-	-	-	Introduction of TS 38.523-3.	0.0.1
2018-03	R5#78	R5-180678	-	-	-	Initial Test Model aspects	0.1.0
2018-04	R5#2-5G-NR	R5-182072	-	-	-	EN-DC: Addition of Test Model aspects	0.2.0
2018-05	R5#79	R5-183237	-	-	-	EN-DC: Test Model updates	1.0.0
2018-06	RAN#80	RP-181212	-	-	-	put under revision control as v15.0.0 with small editorial changes	15.0.0

History

Document history		
V15.0.0	July 2018	Publication