ETSI TS 136 331 V8.17.0 (2012-07)

Technical Specification

LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Radio Resource Control (RRC);
Protocol specification
(3GPP TS 36.331 version 8.17.0 Release 8)

Reference

RTS/TSGR-0236331v8h0

Keywords

LTE

ETSI

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Foreword

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Contents

Foreword

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1 Scope

The present document specifies the Radio Resource Control protocol for the UE-E-UTRAN radio interface.

The scope of the present document also includes:

- the radio related information transported in a transparent container between source eNB and target eNB upon inter eNB handover;

- the radio related information transported in a transparent container between a source or target eNB and another system upon inter RAT handover.

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]   3GPP TS nn.nnn: "Radio Interface Protocol Architecture".

Editor's note: Document not yet available.

[3]   3GPP TS 36.302: "Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer ".

[4]   3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); UE Procedures in Idle Mode".

[5]   3GPP TS 36.306 "Evolved Universal Terrestrial Radio Access (E-UTRA); UE Radio Access Capabilities".

[6]   3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".

[7]   3GPP TS 36.322:"Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification".

[8]   3GPP TS 36.323: "Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) Specification".

[9]   3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2".

[10]   3GPP TS 22.011: "Service accessibility".

[11]   3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".

[12]   3GPP2 C.S0002-A v6.0: "Physical Layer Standard for cdma2000 Spread Spectrum Systems – Release A".

[13]   ITU-T Recommendation X.680 (07/2002) "Information Technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation" (Same as the ISO/IEC International Standard 8824-1).

[14]   ITU-T Recommendation X.681 (07/2002) "Information Technology - Abstract Syntax Notation One (ASN.1): Information object specification" (Same as the ISO/IEC International Standard 8824-2).

[15]   ITU-T Recommendation X.691 (07/2002) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).

[16]   3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[17]   3GPP TS 25.101: "Universal Terrestrial Radio Access (UTRA); User Equipment (UE) radio transmission and reception (FDD)".

[18]   3GPP TS 25.102: "Universal Terrestrial Radio Access (UTRA); User Equipment (UE) radio transmission and reception (TDD)".

[19]   3GPP TS 25.331:"Universal Terrestrial Radio Access (UTRA); Radio Resource Control (RRC); Protocol specification".

[20]   3GPP TS 45.005: "Radio transmission and reception".

[21]   3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

[22]   3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

[23]   3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".

[24]   3GPP2 C.S0057-B v1.0: "Band Class Specification for cdma2000 Spread Spectrum Systems".

[25]   3GPP2 C.S0005-A v6.0: "Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems – Release A, Addendum 2".

[26]   3GPP2 C.S0024-A v3.0: "cdma2000 High Rate Packet Data Air Interface Specification".

[27]   3GPP TS 23.003: "Numbering, addressing and identification".

[28]   3GPP TS 45.008: "Radio subsystem link control".

[29]   3GPP TS 25.133: "Requirements for Support of Radio Resource Management (FDD)".

[30]   3GPP TS 25.123: "Requirements for Support of Radio Resource Management (TDD)".

[31]   3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access (E-UTRA); Architecture description".

[32]   3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

[33]   3GPP2 A.S0008-C v2.0: "Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network"

[34]   3GPP2 C.S0004-A v6.0: "Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems – Addendum 2"

[35]   3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[36]   3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[37]   3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[38]   3GPP TS 23.038: "Alphabets and Language".

[39]   3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access (E-UTRAN); S1 Application Protocol (S1 AP)".

[40]   3GPP TS 25.304: "Universal Terrestrial Radio Access (UTRAN); User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode".

[41]   3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[42]   3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[43]   3GPP TS 44.005: "Data Link (DL) Layer General Aspects".

[44]   3GPP2 C.S0087-0 v2.0: "E-UTRAN - cdma2000 HRPD Connectivity and Interworking: Air Interface Specification"

[45]   3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol".

[46]   3GPP TS 25.223: "Spreading and modulation (TDD)".

[47]   3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

[48]   3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer - Measurements".

[49]   3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core network protocols; Stage 3".

[50]   3GPP2 C.S0097-0 v1.0: "E-UTRAN - cdma2000 1x Connectivity and Interworking Air Interface Specification".

[51]   3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".

3   Definitions, symbols and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in 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 TR 21.905 [1].

Information element: A structural element containing a single or multiple fields is referred as information element.

Field: The individual contents of an information element are referred as fields.

3.2   Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

1xRTT	CDMA2000 1x Radio Transmission Technology
AM	Acknowledged Mode
ASN.1	Abstract Syntax Notation.1
ARQ	Automatic Repeat Request
AS	Access Stratum

BCCH	Broadcast Control Channel
BCH	Broadcast Channel
CCCH	Common Control Channel
CCO	Cell Change Order
CP	Control Plane
C-RNTI	Cell RNTI
CSG	Closed Subscriber Group
DCCH	Dedicated Control Channel
DRB	(user) Data Radio Bearer
DRX	Discontinuous Reception
DTCH	Dedicated Traffic Channel
DL	Downlink
DL-SCH	Downlink Shared Channel
ETWS	Earthquake and Tsunami Warning System
E-UTRA	Evolved Universal Terrestrial Radio Access
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
ENB	Evolved Node B
EPC	Enhanced Packet Core
EPS	Enhanced Packet System
FLOOR	Mathematical function used to 'round down' i.e. to the nearest integer having a lower value
FDD	Frequency Division Duplex
FFS	For Further Study
GERAN	GSM/EDGE Radio Access Network
GSM	Global System for Mobile Communications
HARQ	Hybrid Automatic Repeat Request
HRPD	CDMA2000 High Rate Packet Data
IE	Information element
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
kB	Kilobyte (1000 bytes)
L1	Layer 1
L2	Layer 2
L3	Layer 3
MAC	Medium Access Control
MBMS	Multimedia Broadcast Multicast Service
MBSFN	Multimedia Broadcast multicast service Single Frequency Network
MIB	Master Information Block
N/A	Not Applicable
NACC	Network Assisted Cell Change
NAS	Non Access Stratum
PCCH	Paging Control Channel
PDU	Protocol Data Unit
PDCP	Packet Data Convergence Protocol
PLMN	Public Land Mobile Network
QoS	Quality of Service
RACH	Random Access CHannel
RAT	Radio Access Technology
RB	Radio Bearer
RLC	Radio Link Control
RNTI	Radio Network Temporary Identifier
RRC	Radio Resource Control
RSCP	Received Signal Code Power
RSRP	Reference Signal Received Power
RSSI	Received Signal Strength Indicator
SAE	System Architecture Evolution
SAP	Service Access Point
SFN	System Frame Number
SI	System Information
SIB	System Information Block
SI-RNTI	System Information RNTI
SPS	Semi-Persistent Scheduling
SRB	Signalling Radio Bearer

S-TMSI   SAE Temporary Mobile Station Identifier
TA   Tracking Area
TDD   Time Division Duplex
TM   Transparent Mode
TPC-RNTI   Transmit Power Control RNTI
UE   User Equipment
UICC   Universal Integrated Circuit Card
UL   Uplink
UM   Unacknowledged Mode
UL-SCH   Uplink Shared Channel
UP   User Plane
UTRAN   Universal Terrestrial Radio Access Network

In the ASN.1, lower case may be used for some (parts) of the above abbreviations e.g. c-RNTI

4 General

4.1 Introduction

This specification is organised as follows:

- sub-clause 4.2 describes the RRC protocol model;

- sub-clause 4.3 specifies the services provided to upper layers as well as the services expected from lower layers;

- sub-clause 4.4 lists the RRC functions;

- clause 5 specifies RRC procedures, including UE state transitions;

- clause 6 specifies the RRC message in a mixed format (i.e. tabular & ASN.1 together);

- clause 7 specifies the variables (including protocol timers and constants) and counters to be used by the UE;

- clause 8 specifies the encoding of the RRC messages;

- clause 9 specifies the specified and default radio configurations;

- clause 10 specifies the RRC messages transferred across network nodes;

- clause 11 specifies the UE capability related constraints and performance requirements.

4.2 Architecture

4.2.1 UE states and state transitions including inter RAT

A UE is in RRC_CONNECTED when an RRC connection has been established. If this is not the case, i.e. no RRC connection is established, the UE is in RRC_IDLE state. The RRC states can further be characterised as follows:

- **RRC_IDLE**:

    - A UE specific DRX may be configured by upper layers.

    - UE controlled mobility;

    - The UE:

        - Monitors a Paging channel to detect incoming calls, system information change, and for ETWS capable UEs, ETWS notification;

        - Performs neighbouring cell measurements and cell (re-)selection;

- Acquires system information.

- **RRC_CONNECTED**:

    - Transfer of unicast data to/from UE.

    - At lower layers, the UE may be configured with a UE specific DRX.

    - Network controlled mobility, i.e. handover and cell change order with optional network assistance (NACC) to GERAN;

    - The UE:

        - Monitors a Paging channel and/ or System Information Block Type 1 contents to detect system information change, and for ETWS capable UEs, ETWS notification;

        Monitors control channels associated with the shared data channel to determine if data is scheduled for it;

        - Provides channel quality and feedback information;

        - Performs neighbouring cell measurements and measurement reporting;

        - Acquires system information.

The following figure not only provides an overview of the RRC states in E-UTRA, but also illustrates the mobility support between E-UTRAN, UTRAN and GERAN.
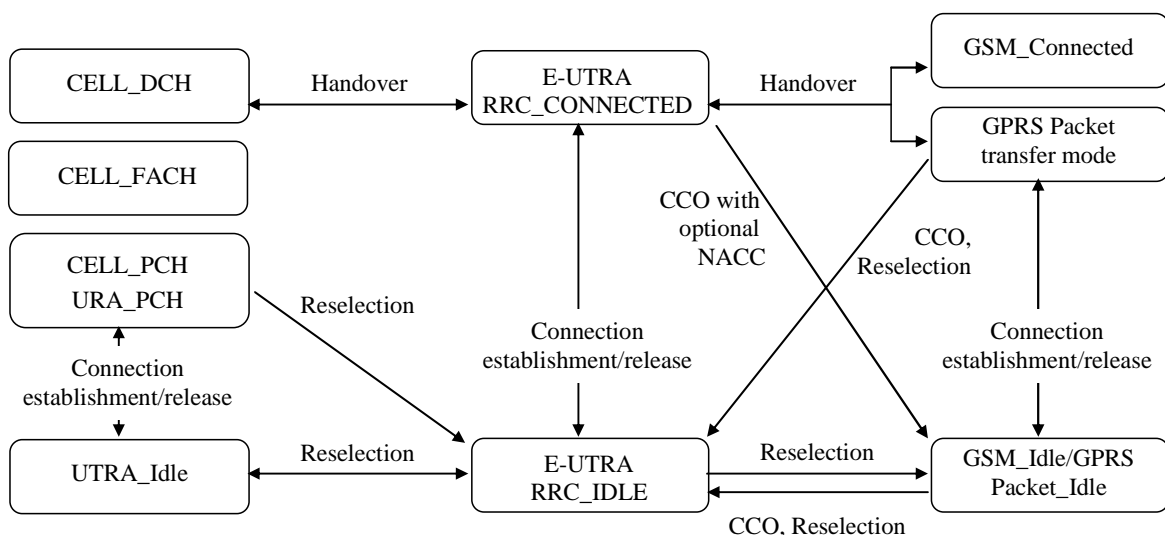
Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP

The following figure illustrates the mobility support between E-UTRAN, CDMA2000 1xRTT and CDMA2000 HRPD. The details of the CDMA2000 state models are out of the scope of this specification.
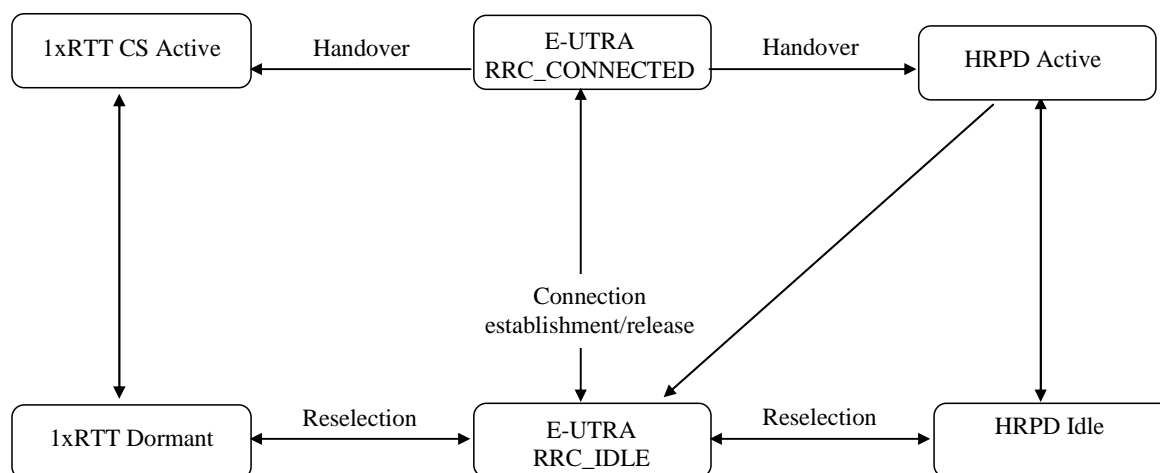
Figure 4.2.1-2: Mobility procedures between E-UTRA and CDMA2000

The inter-RAT handover procedure(s) supports the case of signalling, conversational services, non-conversational services and combinations of these. The mobility between E-UTRA and non-3GPP systems other than CDMA2000 is FFS.

In addition to the state transitions shown in Figure 4.2.1-1 and Figure 4.2.1-2, there is support for connection release with redirection information from E-UTRA RRC_CONNECTED to GERAN, UTRAN and CDMA2000 (HRPD Idle/ 1xRTT Dormant mode).

4.2.2   Signalling radio bearers

"Signalling Radio Bearers" (SRBs) are defined as Radio Bearers (RB) that are used only for the transmission of RRC and NAS messages. More specifically, the following three SRBs are defined:

-   SRB0 is for RRC messages using the CCCH logical channel;

-   SRB1 is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel;

-   SRB2 is for NAS messages, using DCCH logical channel. SRB2 has a lower-priority than SRB1 and is always configured by E-UTRAN after security activation.

In downlink piggybacking of NAS messages is used only for one dependant (i.e. with joint success/ failure) procedure: bearer establishment/ modification/ release. In uplink NAS message piggybacking is used only for transferring the initial NAS message during connection setup.

    NOTE: The NAS messages transferred via SRB2 are also contained in RRC messages, which however do not include any RRC protocol control information.

Once security is activated, all RRC messages on SRB1 and SRB2, including those containing NAS or non-3GPP messages, are integrity protected and ciphered by PDCP. NAS independently applies integrity protection and ciphering to the NAS messages.

4.3 Services

4.3.1 Services provided to upper layers

The RRC protocol offers the following services to upper layers:

- Broadcast of common control information;

- Notification of UEs in RRC_IDLE, e.g. about a terminating call, for ETWS;

- Transfer of dedicated control information, i.e. information for one specific UE.

4.3.2 Services expected from lower layers

In brief, the following are the main services that RRC expects from lower layers:

- PDCP: integrity protection and ciphering;

- RLC: reliable and in-sequence transfer of information, without introducing duplicates and with support for segmentation and concatenation.

Further details about the services provided by Packet Data Convergence Protocol layer (e.g. integrity and ciphering) are provided in TS 36.323 [8]. The services provided by Radio Link Control layer (e.g. the RLC modes) are specified in TS 36.322 [7]. Further details about the services provided by Medium Access Control layer (e.g. the logical channels) are provided in TS 36.321 [6]. The services provided by physical layer (e.g. the transport channels) are specified in TS 36.302 [3].

4.4 Functions

The RRC protocol includes the following main functions:

- Broadcast of system information:

  - Including NAS common information;

  - Information applicable for UEs in RRC_IDLE, e.g. cell (re-)selection parameters, neighbouring cell information and information (also) applicable for UEs in RRC_CONNECTED, e.g. common channel configuration information.

  - Including ETWS notification;

- RRC connection control:

  - Paging;

  - Establishment/ modification/ release of RRC connection, including e.g. assignment/ modification of UE identity (C-RNTI), establishment/ modification/ release of SRB1 and SRB2, access class barring;

  - Initial security activation, i.e. initial configuration of AS integrity protection (SRBs) and AS ciphering (SRBs, DRBs);

  - RRC connection mobility including e.g. intra-frequency and inter-frequency handover, associated security handling, i.e. key/ algorithm change, specification of RRC context information transferred between network nodes;

  - Establishment/ modification/ release of RBs carrying user data (DRBs);

  - Radio configuration control including e.g. assignment/ modification of ARQ configuration, HARQ configuration, DRX configuration;

  - QoS control including assignment/ modification of semi-persistent scheduling (SPS) configuration information for DL and UL, assignment/ modification of parameters for UL rate control in the UE, i.e. allocation of a priority and a prioritised bit rate (PBR) for each RB;

- Recovery from radio link failure;

- Inter-RAT mobility including e.g. security activation, transfer of RRC context information;

- Measurement configuration and reporting:

  - Establishment/ modification/ release of measurements (e.g. intra-frequency, inter-frequency and inter- RAT measurements);

  - Setup and release of measurement gaps;

  - Measurement reporting;

- Other functions including e.g. transfer of dedicated NAS information and non-3GPP dedicated information, transfer of UE radio access capability information, support for E-UTRAN sharing (multiple PLMN identities);

- Generic protocol error handling;

- Support of self-configuration and self-optimisation;

NOTE: Random access is specified entirely in the MAC including initial transmission power estimation.

5 Procedures

5.1 General

5.1.1 Introduction

The procedural requirements are structured according to the main functional areas: system information (5.2), connection control (5.3), inter-RAT mobility (5.4) and measurements (5.5). In addition there is a sub-clause other (5.6) that covers e.g. NAS dedicated information transfer, UE capability transfer. Finally, sub-clause 5.7 specifies the generic error handling.

5.1.2 General requirements

The UE shall:

1> process the received messages in order of reception by RRC, i.e. the processing of a message shall be completed before starting the processing of a subsequent message;

NOTE 1: E-UTRAN may initiate a subsequent procedure prior to receiving the UE's response of a previously initiated procedure.

1> within a sub-clause execute the steps according to the order specified in the procedural description;

1> set the *rrc-TransactionIdentifier* in the response message, if included, to the same value as included in the message received from E-UTRAN that triggered the response message;

1> upon receiving a choice value set to '*setup*':

2> apply the corresponding received configuration and start using the associated resources, unless explicitly specified otherwise;

1> upon receiving a choice value set to '*release*':

2> clear the corresponding configuration and stop using the associated resources;

NOTE 2: At each point in time, the UE keeps a single value for each field except for during handover when the UE temporarily stores the previous configuration so it can revert back upon handover failure. In other words: when the UE reconfigures a field, the existing value is released except for during handover.

5.2 System information

5.2.1 Introduction

5.2.1.1 General

System information is divided into the *MasterInformationBlock* (MIB) and a number of *SystemInformationBlocks* (SIBs). The MIB includes a limited number of most essential and most frequently transmitted parameters that are needed to acquire other information from the cell, and is transmitted on BCH. SIBs other than *SystemInformationBlockType1* are carried in *SystemInformation* (SI) messages and mapping of SIBs to SI messages is flexibly configurable by *schedulingInfoList* included in *SystemInformationBlockType1*, with restrictions that: each SIB is contained only in a single SI message, only SIBs having the same scheduling requirement (periodicity) can be mapped to the same SI message, and *SystemInformationBlockType2* is always mapped to the SI message that corresponds to the first entry in the list of SI messages in *schedulingInfoList*. There may be multiple SI messages transmitted with the same periodicity. *SystemInformationBlockType1* and all SI messages are transmitted on DL-SCH.

5.2.1.2 Scheduling

The MIB uses a fixed schedule with a periodicity of 40 ms and repetitions made within 40 ms. The first transmission of the MIB is scheduled in subframe #0 of radio frames for which the SFN mod 4 = 0, and repetitions are scheduled in subframe #0 of all other radio frames.

The *SystemInformationBlockType1* uses a fixed schedule with a periodicity of 80 ms and repetitions made within 80 ms. The first transmission of *SystemInformationBlockType1* is scheduled in subframe #5 of radio frames for which the SFN mod 8 = 0, and repetitions are scheduled in subframe #5 of all other radio frames for which SFN mod 2 = 0.

The SI messages are transmitted within periodically occurring time domain windows (referred to as SI-windows) using dynamic scheduling. Each SI message is associated with a SI-window and the SI-windows of different SI messages do not overlap. That is, within one SI-window only the corresponding SI is transmitted. The length of the SI-window is common for all SI messages, and is configurable. Within the SI-window, the corresponding SI message can be transmitted a number of times in any subframe other than MBSFN subframes, uplink subframes in TDD, and subframe #5 of radio frames for which SFN mod 2 = 0. The UE acquires the detailed time-domain scheduling (and other information, e.g. frequency-domain scheduling, used transport format) from decoding SI-RNTI on PDCCH (see TS 36.321 [6]).

A single SI-RNTI is used to address *SystemInformationBlockType1* as well as all SI messages.

SystemInformationBlockType1 configures the SI-window length and the transmission periodicity for the SI messages.

5.2.1.3 System information validity and notification of changes

Change of system information (other than for ETWS) only occurs at specific radio frames, i.e. the concept of a modification period is used. System information may be transmitted a number of times with the same content within a modification period, as defined by its scheduling. The modification period boundaries are defined by SFN values for which SFN mod *m*= 0, where *m* is the number of radio frames comprising the modification period. The modification period is configured by system information.

When the network changes (some of the) system information, it first notifies the UEs about this change, i.e. this may be done throughout a modification period. In the next modification period, the network transmits the updated system information. These general principles are illustrated in figure 5.2.1.3-1, in which different colours indicate different system information. Upon receiving a change notification, the UE acquires the new system information immediately from the start of the next modification period. The UE applies the previously acquired system information until the UE acquires the new system information.
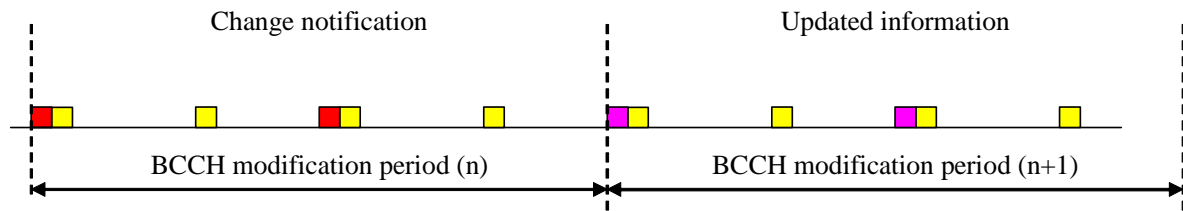
Figure 5.2.1.3-1: Change of system Information

The *Paging* message is used to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change. If the UE receives a *Paging* message including the *systemInfoModification*, it knows that the system information will change at the next modification period boundary. Although the UE may be informed about changes in system information, no further details are provided e.g. regarding which system information will change.

SystemInformationBlockType1 includes a value tag, *systemInfoValueTag*, that indicates if a change has occurred in the SI messages. UEs may use *systemInfoValueTag*, e.g. upon return from out of coverage, to verify if the previously stored SI messages are still valid. Additionally, the UE considers stored system information to be invalid after 3 hours from the moment it was successfully confirmed as valid, unless specified otherwise.

E-UTRAN may not update *systemInfoValueTag* upon change of some system information e.g. ETWS information, regularly changing parameters like CDMA2000 system time (see 6.3). Similarly, E-UTRAN may not include the *systemInfoModification* within the *Paging* message upon change of some system information.

The UE verifies that stored system information remains valid by either checking *systemInfoValueTag* in *SystemInformationBlockType1* after the modification period boundary, or attempting to find the *systemInfoModification* indication at least *modificationPeriodCoeff* times during the modification period in case no paging is received, in every modification period. If no paging message is received by the UE during a modification period, the UE may assume that no change of system information will occur at the next modification period boundary. If UE in RRC_CONNECTED, during a modification period, receives one paging message, it may deduce from the presence/ absence of *systemInfoModification* whether a change of system information other than ETWS information will occur in the next modification period or not.

ETWS capable UEs in RRC_CONNECTED shall attempt to read paging at least once every *defaultPagingCycle* to check whether ETWS notification is present or not.

5.2.1.4   Indication of ETWS notification

ETWS primary notification and/ or ETWS secondary notification can occur at any point in time. The *Paging* message is used to inform ETWS capable UEs in RRC_IDLE and UEs in RRC_CONNECTED about presence of an ETWS primary notification and/ or ETWS secondary notification. If the UE receives a *Paging* message including the *etws-Indication*, it shall start receiving the ETWS primary notification and/ or ETWS secondary notification according to *schedulingInfoList* contained in *SystemInformationBlockType1*.

NOTE: The UE is not required to periodically check *schedulingInfoList* contained in *SystemInformationBlockType1*, but *Paging* message including the *etws-Indication* triggers the UE to re-acquire *schedulingInfoList* contained in *SystemInformationBlockType1* for scheduling changes for *SystemInformationBlockType10* and *SystemInformationBlockType11*. The UE may or may not receive a *Paging* message including the *etws-Indication* and/or *systemInfoModification* when ETWS is no longer scheduled.

ETWS primary notification is contained in *SystemInformationBlockType10* and ETWS secondary notification is contained in *SystemInformationBlockType11*. Segmentation can be applied for the delivery of a secondary notification. The segmentation is fixed for transmission of a given secondary notification within a cell (i.e. the same segment size for a given segment with the same *messageIdentifier*, *serialNumber* and *warningMessageSegmentNumber*).

5.2.2 System information acquisition

5.2.2.1 General
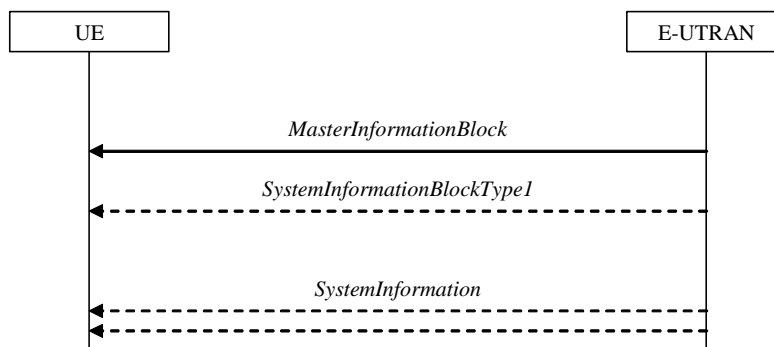
Figure 5.2.2.1-1: System information acquisition, normal

The UE applies the system information acquisition procedure to acquire the AS- and NAS- system information that is broadcasted by the E-UTRAN. The procedure applies to UEs in RRC_IDLE and UEs in RRC_CONNECTED.

5.2.2.2 Initiation

The UE shall apply the system information acquisition procedure upon selecting (e.g. upon power on) and upon re-selecting a cell, after handover completion, after entering E-UTRA from another RAT, upon return from out of coverage, upon receiving a notification that the system information has changed, upon receiving an indication about the presence of an ETWS notification, upon receiving a request from CDMA2000 upper layers and upon exceeding the maximum validity duration. Unless explicitly stated otherwise in the procedural specification, the system information acquisition procedure overwrites any stored system information, i.e. delta configuration is not applicable for system information and the UE discontinues using a field if it is absent in system information unless explicitly specified otherwise.

5.2.2.3 System information required by the UE

The UE shall:

> 1> ensure having a valid version, as defined below, of (at least) the following system information, also referred to as the 'required' system information:

>> 2> if in RRC_IDLE:

>>> 3> the *MasterInformationBlock* and *SystemInformationBlockType1* as well as *SystemInformationBlockType2* through *SystemInformationBlockType8*, depending on support of the concerned RATs;

>> 2> if in RRC_CONNECTED:

>>> 3> the *MasterInformationBlock*, *SystemInformationBlockType1* and *SystemInformationBlockType2* as well as *SystemInformationBlockType8*, depending on support of CDMA2000;

> 1> delete any stored system information after 3 hours from the moment it was confirmed to be valid as defined in 5.2.1.3, unless specified otherwise;

> 1> consider any stored system information except *SystemInformationBlockType10* and *SystemInformationBlockType11* to be invalid if *systemInfoValueTag* included in the *SystemInformationBlockType1* is different from the one of the stored system information;

5.2.2.4 System information acquisition by the UE

The UE shall:

> 1> apply the specified BCCH configuration defined in 9.1.1.1;

1> if the procedure is triggered by a system information change notification:

2> start acquiring the required system information, as defined in 5.2.2.3, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received system information until the new system information has been acquired.

1> if the UE is in RRC_IDLE and enters a cell for which the UE does not have stored a valid version of the system information required in RRC_IDLE, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_IDLE, as defined in 5.2.2.3;

1> following successful handover completion to a cell for which the UE does not have stored a valid version of the system information required in RRC_CONNECTED, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_CONNECTED, as defined in 5.2.2.3;

2> upon acquiring the concerned system information:

3> discard the corresponding radio resource configuration information included in the *radioResourceConfigCommon* previously received in a dedicated message, if any;

1> following a request from CDMA2000 upper layers:

2> acquire *SystemInformationBlockType8*, as defined in 5.2.3;

1> neither initiate the RRC connection establishment procedure nor initiate transmission of the *RRCConnectionReestablishmentRequest* message until the UE has a valid version of the *MasterInformationBlock* and *SystemInformationBlockType1* messages as well as *SystemInformationBlockType2* ;

1> if the UE is ETWS capable:

2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*;

2> when the UE acquires *SystemInformationBlockType1* following ETWS indication, upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:

4> start acquiring *SystemInformationBlockType10* immediately;

3> if *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:

4> start acquiring *SystemInformationBlockType11* immediately;

NOTE 2: UEs shall start acquiring *SystemInformationBlockType10* and *SystemInformationBlockType11* as described above even when *systemInfoValueTag* in *SystemInformationBlockType1* has not changed.

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

NOTE 3: While attempting to acquire a particular SIB, if the UE detects from *schedulingInfoList* that it is no longer present, the UE should stop trying to acquire the particular SIB.

5.2.2.5   Essential system information missing

The UE shall

1> if in RRC_IDLE or in RRC_CONNECTED while T311 is running; and

1> if the UE is unable to acquire the *MasterInformationBlock* or the *SystemInformationBlockType1*:

2> consider the cell as barred in accordance with TS 36.304 [4] and;

2> perform barring as if *intraFreqReselection* is set to '*allowed*', and as if the *csg-Indication* is set to '*FALSE*';

1> else if the UE is unable to acquire the *SystemInformationBlockType2*:

2> treat the cell as barred in accordance with TS 36.304 [4];

5.2.2.6 Actions upon reception of the *MasterInformationBlock* message

Upon receiving the *MasterInformationBlock* message the UE shall:

1> apply the radio resource configuration included in the *phich-Config*;

1> if the UE is in RRC_IDLE or if the UE is in RRC_CONNECTED while T311 is running:

2> if the UE has no valid system information stored according to 5.2.2.3 for the concerned cell:

3> apply the received value of *dl-Bandwidth* to the *ul-Bandwidth* until *SystemInformationBlockType2* is received;

5.2.2.7 Actions upon reception of the *SystemInformationBlockType1* message

Upon receiving the *SystemInformationBlockType1* message the UE shall:

1> if the frequency band indicated in the *freqBandIndicator* is part of the frequency bands supported by the UE; or

1> if the UE supports *multiBandInfoList,* and if one or more of the frequency bands indicated in the *multiBandInfoList* are part of the frequency bands supported by the UE:

2> forward the *cellIdentity* to upper layers;

2> forward the *trackingAreaCode* to upper layers;

1> else:

2> consider the cell as barred in accordance with TS 36.304 [4] and;

2> perform barring as if *intraFreqReselection* is set to *notAllowed*, and as if the *csg-Indication* is set to *FALSE*;

5.2.2.8 Actions upon reception of *SystemInformation* messages

No UE requirements related to the contents of the *SystemInformation* messages apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.2.2.9 Actions upon reception of *SystemInformationBlockType2*

Upon receiving *SystemInformationBlockType2*, the UE shall:

1> if upper layers indicate that a (UE specific) paging cycle is configured:

2> Apply the shortest of the (UE specific) paging cycle and the *defaultPagingCycle* included in the *radioResourceConfigCommon*;

1> else:

2> Apply the *defaultPagingCycle* included in the *radioResourceConfigCommon*;

1> if the *mbsfn-SubframeConfigList* is included:

2> consider that no other DL assignments occur in the MBSFN subframes indicated in the IE *mbsfn-SubframeConfigList*:

1> apply the configuration included in the *radioResourceConfigCommon*;

1> apply the specified PCCH configuration defined in 9.1.1.3;

1> not apply the *timeAlignmentTimerCommon*;

5.2.2.10 Actions upon reception of *SystemInformationBlockType3*

No UE requirements related to the contents of this *SystemInformationBlock* apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.2.2.11 Actions upon reception of *SystemInformationBlockType4*

No UE requirements related to the contents of this *SystemInformationBlock* apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.2.2.12 Actions upon reception of *SystemInformationBlockType5*

No UE requirements related to the contents of this *SystemInformationBlock* apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.2.2.13 Actions upon reception of *SystemInformationBlockType6*

No UE requirements related to the contents of this *SystemInformationBlock* apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.2.2.14 Actions upon reception of *SystemInformationBlockType7*

No UE requirements related to the contents of this *SystemInformationBlock* apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.2.2.15 Actions upon reception of *SystemInformationBlockType8*

Upon receiving *SystemInformationBlockType8*, the UE shall:

1> if the *systemTimeInfo* is included:

2> forward the *systemTimeInfo* to CDMA2000 upper layers;

1> if the UE is in RRC_IDLE and if *searchWindowSize* is included:

2> forward the *searchWindowSize* to CDMA2000 upper layers;

1> if *parametersHRPD* is included;

2> forward the *preRegistrationInfoHRPD* to CDMA2000 upper layers only if the UE has not received the *preRegistrationInfoHRPD* within an *RRCConnectionReconfiguration* message after entering this cell;

2> if the *cellReselectionParametersHRPD* is included:

3> forward the *neighCellListHRPD* to the CDMA2000 upper layers;

1> if the *parameters1XRTT* is included:

2> if the *csfb-RegistrationParam1XRTT* is included:

3> forward the *csfb-RegistrationParam1XRTT* to the CDMA2000 upper layers which will use this information to determine if a CS registration/re-registration towards CDMA2000 1xRTT in the EUTRA cell is required;

2> else:

3> indicate to CDMA2000 upper layers that CSFB Registration to CDMA2000 1xRTT is not allowed;

2> if the *longCodeState1XRTT* is included:

3> forward the *longCodeState1XRTT* to CDMA2000 upper layers;

2> if the *cellReselectionParameters1XRTT* is included:

3> forward the *neighCellList1XRTT* to the CDMA2000 upper layers;

5.2.2.16 Actions upon reception of *SystemInformationBlockType9*

Upon receiving *SystemInformationBlockType9*, the UE shall:

1> if *hnb-Name* is included, forward the *hnb-Name* to upper layers;

5.2.2.17 Actions upon reception of *SystemInformationBlockType10*

Upon receiving *SystemInformationBlockType10*, the UE shall:

1> forward the received *warningType*, *warningSecurityInfo* (if present), *messageIdentifier* and *serialNumber* to upper layers;

5.2.2.18 Actions upon reception of *SystemInformationBlockType11*

Upon receiving *SystemInformationBlockType11*, the UE shall:

1> if there is no current value for *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*; or

1> if either the received value of *messageIdentifier* or of s*erialNumber* or of both are different from the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*:

2> use the received values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11* as the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*;

2> discard any previously buffered *warningMessageSegment*;

2> if all segments of a warning message have been received:

3> assemble the *warningMessage* from the received *warningMessageSegment*;

3> forward the received *warningMessage*, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

3> stop reception of SystemInformationBlockType11;

3> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> else:

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType11*;

1> else if all segments of a warning message have been received:

2> assemble the *warningMessage* from the received *warningMessageSegment*;

2> forward the received complete *warningMessage*, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> stop reception of *SystemInformationBlockType11*;

2> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

1> else:

    2> store the received *warningMessageSegment*;

    2> continue reception of SystemInformationBlockType11;

5.2.3   Acquisition of an SI message

When acquiring an SI message, the UE shall:

1> determine the start of the SI-window for the concerned SI message as follows:

    2> for the concerned SI message, determine the number *n* which corresponds to the order of entry in the list of SI messages configured by *schedulingInfoList* in *SystemInformationBlockType1*;

    2> determine the integer value $x = (n – 1)*w$, where *w* is the *si-WindowLength*;

    2> the SI-window starts at the subframe #*a*, where $a = x$ mod 10, in the radio frame for which SFN mod $T =$ FLOOR(x/10), where *T* is the *si-Periodicity* of the concerned SI message;

NOTE: E-UTRAN should configure an SI-window of 1 ms only if all SIs are scheduled before subframe #5 in radio frames for which SFN mod 2 = 0.

1> receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by *si-WindowLength*, or until the SI message was received, excluding the following subframes:

    2> subframe #5 in radio frames for which SFN mod 2 = 0;

    2> any MBSFN subframes;

    2> any uplink subframes in TDD;

1> if the SI message was not received by the end of the SI-window, repeat reception at the next SI-window occasion for the concerned SI message;

5.3   Connection control

5.3.1   Introduction

5.3.1.1   RRC connection control

RRC connection establishment involves the establishment of SRB1. E-UTRAN completes RRC connection establishment prior to completing the establishment of the S1 connection, i.e. prior to receiving the UE context information from the EPC. Consequently, AS security is not activated during the initial phase of the RRC connection. During this initial phase of the RRC connection, the E-UTRAN may configure the UE to perform measurement reporting. However, the UE only accepts a handover message when security has been activated.

Upon receiving the UE context from the EPC, E-UTRAN activates security (both ciphering and integrity protection) using the initial security activation procedure. The RRC messages to activate security (command and successful response) are integrity protected, while ciphering is started only after completion of the procedure. That is, the response to the message used to activate security is not ciphered, while the subsequent messages (e.g. used to establish SRB2 and DRBs) are both integrity protected and ciphered.

After having initiated the initial security activation procedure, E-UTRAN initiates the establishment of SRB2 and DRBs, i.e. E-UTRAN may do this prior to receiving the confirmation of the initial security activation from the UE. In any case, E-UTRAN will apply both ciphering and integrity protection for the RRC connection reconfiguration messages used to establish SRB2 and DRBs. E-UTRAN should release the RRC connection if the initial security activation and/ or the radio bearer establishment fails (i.e. security activation and DRB establishment are triggered by a joint S1-procedure, which does not support partial success).

For SRB2 and DRBs, security is always activated from the start, i.e. the E-UTRAN does not establish these bearers prior to activating security.

The release of the RRC connection is initiated by E-UTRAN. The procedure may be used to re-direct the UE to another frequency or RAT. In exceptional cases the UE may abort the RRC connection, i.e. move to RRC_IDLE without notifying E-UTRAN.

5.3.1.2 Security

AS security comprises of the integrity protection of RRC signalling (SRBs) as well as the ciphering of RRC signalling (SRBs) and user data (DRBs).

RRC handles the configuration of the security parameters which are part of the AS configuration: the integrity protection algorithm, the ciphering algorithm and two parameters, namely the *keyChangeIndicator* and the *nextHopChainingCount,* which are used by the UE to determine the AS security keys upon handover and/ or connection re-establishment.

The integrity protection algorithm is common for signalling radio bearers SRB1 and SRB2. The ciphering algorithm is common for all radio bearers (i.e. SRB1, SRB2 and DRBs). Neither integrity protection nor ciphering applies for SRB0.

RRC integrity and ciphering are always activated together, i.e. in one message/ procedure. RRC integrity and ciphering are never de-activated. However, it is possible to switch to a 'NULL' ciphering algorithm (eea0).

NOTE 1: UICC-less emergency calls are not supported in this release of the specification.

NOTE 2: Lower layers discard RRC messages for which the integrity check has failed and indicate the integrity verification check failure to RRC.

The AS applies three different security keys: one for the integrity protection of RRC signalling (K_{RRCint}), one for the ciphering of RRC signalling (K_{RRCenc}) and one for the ciphering of user data (K_{UPenc}). All three AS keys are derived from the K_{eNB} key. The K_{eNB} is based on the K_{ASME} key, which is handled by upper layers.

Upon connection establishment new AS keys are derived. No AS-parameters are exchanged to serve as inputs for the derivation of the new AS keys at connection establishment.

The integrity and ciphering of the RRC message used to perform handover is based on the security configuration used prior to the handover and is performed by the source eNB.

The integrity and ciphering algorithms can only be changed upon handover. The four AS keys (K_{eNB}, K_{RRCint}, K_{RRCenc} and K_{UPenc}) change upon every handover and connection re-establishment. The *keyChangeIndicator* is used upon handover and indicates whether the UE should use the keys associated with the latest available K_{ASME} key. The *nextHopChainingCount* parameter is used upon handover and connection re-establishment by the UE when deriving the new K_{eNB} that is used to generate K_{RRCint}, K_{RRCenc} and K_{UPenc} (see TS 33.401 [32]). An intra cell handover procedure may be used to change the keys in RRC_CONNECTED.

For each radio bearer an independent counter (COUNT, as specified in TS 36.323 [8]) is maintained for each direction. For each DRB, the COUNT is used as input for ciphering. For each SRB, the COUNT is used as input for both ciphering and integrity protection. It is not allowed to use the same COUNT value more than once for a given security key. In order to limit the signalling overhead, individual messages/ packets include a short sequence number (PDCP SN, as specified in TS 36.323 [8]). In addition, an overflow counter mechanism is used: the hyper frame number (TX_HFN and RX_HFN, as specified in TS 36.323 [8]). The HFN needs to be synchronized between the UE and the eNB. The eNB is responsible for avoiding reuse of the COUNT with the same RB identity and with the same K_{eNB}, e.g. due to the transfer of large volumes of data, release and establishment of new RBs. In order to avoid such re-use, the eNB may e.g. use different RB identities for successive RB establishments, trigger an intra cell handover or an RRC_CONNECTED to RRC_IDLE to RRC_CONNECTED transition.

For each SRB, the value provided by RRC to lower layers to derive the 5-bit BEARER parameter used as input for ciphering and for integrity protection is the value of the corresponding *srb-Identity* with the MSBs padded with zeroes.

5.3.1.3 Connected mode mobility

In RRC_CONNECTED, the network controls UE mobility, i.e. the network decides when the UE shall move to which cell (which may be on another frequency or RAT). For network controlled mobility in RRC_CONNECTED, handover is the only procedure that is defined. The network triggers the handover procedure e.g. based on radio conditions, load.

To facilitate this, the network may configure the UE to perform measurement reporting (possibly including the configuration of measurement gaps). The network may also initiate handover blindly, i.e. without having received measurement reports from the UE.

Before sending the handover message to the UE, the source eNB prepares one or more target cells. The target eNB generates the message used to perform the handover, i.e. the message including the AS-configuration to be used in the target cell. The source eNB transparently (i.e. does not alter values/ content) forwards the handover message/ information received from the target to the UE. When appropriate, the source eNB may initiate data forwarding for (a subset of) the DRBs.

After receiving the handover message, the UE attempts to access the target cell at the first available RACH occasion according to Random Access resource selection defined in TS 36.321 [6], i.e. the handover is asynchronous. Consequently, when allocating a dedicated preamble for the random access in the target cell, E-UTRA shall ensure it is available from the first RACH occasion the UE may use. Upon successful completion of the handover, the UE sends a message used to confirm the handover.

After the successful completion of handover, PDCP SDUs may be re-transmitted in the target cell. This only applies for DRBs using RLC-AM mode. The further details are specified in TS 36.323 [8]. After the successful completion of handover, the SN and the HFN are reset except for the DRBs using RLC-AM mode (for which both SN and HFN continue). The further details are specified in TS 36.323 [8].

One UE behaviour to be performed upon handover is specified, i.e. this is regardless of the handover procedures used within the network (e.g. whether the handover includes X2 or S1 signalling procedures).

The source eNB should, for some time, maintain a context to enable the UE to return in case of handover failure. After having detected handover failure, the UE attempts to resume the RRC connection either in the source or in another cell using the RRC re-establishment procedure. This connection resumption succeeds only if the accessed cell is prepared, i.e. concerns a cell of the source eNB or of another eNB towards which handover preparation has been performed.

5.3.2   Paging

5.3.2.1   General

Figure 5.3.2.1-1: Paging

The purpose of this procedure is to transmit paging information to a UE in RRC_IDLE and/ or to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change and/ or about an ETWS primary notification and/ or ETWS secondary notification. The paging information is provided to upper layers, which in response may initiate RRC connection establishment, e.g. to receive an incoming call.

5.3.2.2   Initiation

E-UTRAN initiates the paging procedure by transmitting the *Paging* message at the UE's paging occasion as specified in TS 36.304 [4]. E-UTRAN may address multiple UEs within a *Paging* message by including one *PagingRecord* for each UE. E-UTRAN may also indicate a change of system information and/ or provide an ETWS notification in the *Paging* message.

5.3.2.3   Reception of the *Paging* message by the UE

Upon receiving the *Paging* message, the UE shall:

> 1> if in RRC_IDLE, for each of the *PagingRecord*, if any, included in the *Paging* message:

2> if the *ue-Identity* included in the *PagingRecord* matches one of the UE identities allocated by upper layers:

    3> forward the *ue-Identity* and the *cn-Domain* to the upper layers;

1> if the *systemInfoModification* is included:

    2> re-acquire the required system information using the system information acquisition procedure as specified in 5.2.2.

1> if the *etws-Indication* is included and the UE is ETWS capable:

    2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary;

    2> if the *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:

        3> acquire *SystemInformationBlockType10*;

    2> if the *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:

        3> acquire *SystemInformationBlockType11*;

5.3.3 RRC connection establishment

5.3.3.1 General
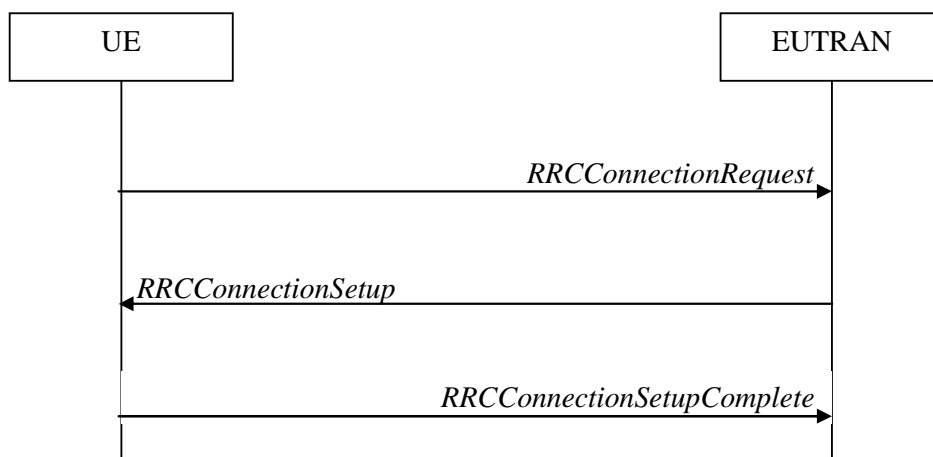
Figure 5.3.3.1-1: RRC connection establishment, successful
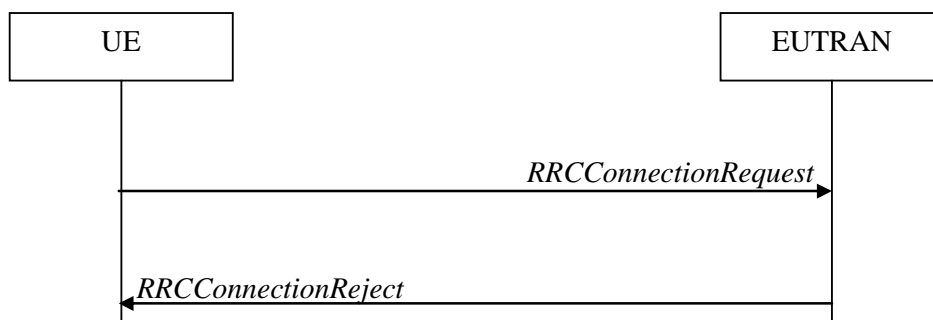
Figure 5.3.3.1-2: RRC connection establishment, network reject

The purpose of this procedure is to establish an RRC connection. RRC connection establishment involves SRB1 establishment. The procedure is also used to transfer the initial NAS dedicated information/ message from the UE to E-UTRAN.

E-UTRAN applies the procedure as follows:

- to establish SRB1 only.

5.3.3.2 Initiation

The UE initiates the procedure when upper layers request establishment of an RRC connection while the UE is in RRC_IDLE.

Upon initiation of the procedure, the UE shall:

1> if the UE is establishing the RRC connection for mobile terminating calls:

   2> if timer T302 is running:

      3> consider access to the cell as barred;

   2> else:

      3> consider access to the cell as not barred;

1> else if the UE is establishing the RRC connection for emergency calls:

   2> if *SystemInformationBlockType2* includes the *ac-BarringInfo*:

      3> if the *ac-BarringForEmergency* is set to *FALSE*:

         4> consider access to the cell as not barred;

      3> else if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11]:

  NOTE 1: ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

         4> if the *ac-BarringInfo* includes *ac-BarringForMO-Data*, and for all of the valid Access Classes for the UE, the corresponding bit in the *ac-BarringForSpecialAC* contained in *ac-BarringForMO-Data* is set to *one*:

            5> consider access to the cell as barred;

         4> else:

            5> consider access to the cell as not barred;

      3> else:

         4> consider access to the cell as barred;

   2> else:

      3> consider access to the cell as not barred;

1> else if the UE is establishing the RRC connection for mobile originating calls:

   2> if timer T302 or T303 is running:

      3> consider access to the cell as barred;

   2> else if *SystemInformationBlockType2* includes the *ac-BarringInfo* and the *ac-BarringForMO-Data* is present:

      3> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

      3> for at least one of these Access Classes the corresponding bit in the *ac-BarringForSpecialAC* contained in *ac-BarringForMO-Data* is set to *zero*:

         4> consider access to the cell as not barred;

      3> else:

4> draw a random number '*rand*' uniformly distributed in the range: $0 \leq rand < 1$;

4> if '*rand*' is lower than the value indicated by *ac-BarringFactor* included in *ac-BarringForMO-Data*:

5> consider access to the cell as not barred;

4> else:

5> consider access to the cell as barred;

2> else:

3> consider access to the cell as not barred;

1> else (the UE is establishing the RRC connection for mobile originating signalling):

2> if timer T302 or T305 is running:

3> consider access to the cell as barred;

2> else if *SystemInformationBlockType2* includes the *ac-BarringInfo* and the *ac-BarringForMO-Signalling* is present:

3> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

3> for at least one of these Access Classes the corresponding bit in the *ac-BarringForSpecialAC* contained in *ac-BarringForMO-Signalling* is set to *zero*:

4> consider access to the cell as not barred;

3> else:

4> draw a random number '*rand*' uniformly distributed in the range: $0 \leq rand < 1$;

4> if '*rand*' is lower than the value indicated by *ac-BarringFactor* included in *ac-BarringForMO-Signalling*:

5> consider access to the cell as not barred;

4> else:

5> consider access to the cell as barred;

2> else:

3> consider access to the cell as not barred;

1> if access to the cell, as specified above, is not barred:

2> apply the default physical channel configuration as specified in 9.2.4;

2> apply the default semi-persistent scheduling configuration as specified in 9.2.3;

2> apply the default MAC main configuration as specified in 9.2.2;

2> apply the CCCH configuration as specified in 9.1.1.2;

2> apply the *timeAlignmentTimerCommon* included in *SystemInformationBlockType2*;

2> start timer T300;

2> initiate transmission of the *RRCConnectionRequest* message in accordance with 5.3.3.3;

NOTE 2: Upon initiating the connection establishment procedure, the UE is not required to ensure it maintains up to date system information applicable only for UEs in RRC_IDLE state. However, the UE needs to perform system information acquisition upon cell re-selection.

1> else:

2> if the UE is establishing the RRC connection for mobile originating calls and if both timers T302 and T303 are not running:

3> draw a random number '*rand*' that is uniformly distributed in the range $0 \leq rand < 1$;

3> start timer T303 with the timer value calculated as follows, using the *ac-BarringTime* included in *ac-BarringForMO-Data*:

T303= (0.7+ 0.6 ∗ *rand*) ∗ *ac-BarringTime*

3> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating calls is applicable, upon which the procedure ends;

2> else if the UE is establishing the RRC connection for mobile originating signalling and if both timers T302 and T305 are not running:

3> draw a random number '*rand*' that is uniformly distributed in the range $0 \leq rand < 1$;

3> start timer T305 with the timer value calculated as follows, using the *ac-BarringTime* included in *ac-BarringForMO-Signalling*:

T305= (0.7+ 0.6 ∗ *rand*) ∗ *ac-BarringTime*

3> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating signalling is applicable, upon which the procedure ends;

2> else if the UE is establishing the RRC connection for emergency calls:

3> inform upper layers about the failure to establish the RRC connection and that access barring for emergency calls is applicable, upon which the procedure ends;

2> else:

3> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

5.3.3.3 Actions related to transmission of *RRCConnectionRequest* message

The UE shall set the contents of *RRCConnectionRequest* message as follows:

1> set the *ue-Identity* as follows:

2> if upper layers provide an S-TMSI:

3> set the *ue-Identity* to the value received from upper layers;

2> else:

3> draw a random value in the range 0 .. 2^{40}-1 and set the *ue-Identity* to this value;

NOTE 1: Upper layers provide the S-TMSI if the UE is registered in the TA of the current cell.

1> set the *establishmentCause* in accordance with the information received from upper layers;

The UE shall submit the *RRCConnectionRequest* message to lower layers for transmission.

The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.5.

5.3.3.4 Reception of the *RRCConnectionSetup* by the UE

NOTE: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> perform the radio resource configuration procedure in accordance with the received *radioResourceConfigDedicated* and as specified in 5.3.10;

1> if stored, discard the cell reselection priority information provided by the *idleModeMobilityControlInfo* or inherited from another RAT;

1> stop timer T300;

1> stop timer T302, if running;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> perform the actions as specified in 5.3.3.7;

1> stop timer T320, if running;

1> enter RRC_CONNECTED;

1> stop the cell re-selection procedure;

1> set the content of *RRCConnectionSetupComplete* message as follows:

    2> set the *selectedPLMN-Identity* to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]) from the PLMN(s) included in the *plmn-IdentityList* in *SystemInformationBlockType1*;

    2> if upper layers provide the 'Registered MME', include and set the *registeredMME* as follows:

        3> if the PLMN identity of the 'Registered MME' is different from the PLMN selected by the upper layers:

            4> include the *plmnIdentity* in the *registeredMME* and set it to the value of the PLMN identity in the 'Registered MME' received from upper layers;

        3> set the *mmegi* and the *mmec* to the value received from upper layers;

    2> set the *dedicatedInfoNAS* to include the information received from upper layers;

    2> submit the *RRCConnectionSetupComplete* message to lower layers for transmission, upon which the procedure ends;

5.3.3.5 Cell re-selection while T300, T302, T303 or T305 is running

The UE shall:

1> if cell reselection occurs while T300, T302, T303 or T305 is running:

    2> if timer T302, T303 and/ or T305 is running:

        3> stop timer T302, T303 and T305, whichever ones were running;

        3> perform the actions as specified in 5.3.3.7;

    2> if timer T300 is running:

        3> stop timer T300;

        3> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

        3> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

5.3.3.6 T300 expiry

The UE shall:

1> if timer T300 expires:

    2> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

    2> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

5.3.3.7 T302, T303 or T305 expiry or stop

The UE shall:

> 1> if timer T302 expires or is stopped:

>> 2> inform upper layers about barring alleviation for mobile terminating access;

>> 2> if timer T303 is not running:

>>> 3> inform upper layers about barring alleviation for mobile originating calls;

>> 2> if timer T305 is not running:

>>> 3> inform upper layers about barring alleviation for mobile originating signalling;

> 1> if timer T303 expires or is stopped:

>> 2> if timer T302 is not running:

>>> 3> inform upper layers about barring alleviation for mobile originating calls;

> 1> if timer T305 expires or is stopped:

>> 2> if timer T302 is not running:

>>> 3> inform upper layers about barring alleviation for mobile originating signalling;

5.3.3.8 Reception of the *RRCConnectionReject* by the UE

The UE shall:

> 1> stop timer T300;

> 1> reset MAC and release the MAC configuration;

> 1> start timer T302, with the timer value set to the *waitTime*;

> 1> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating calls, mobile originating signalling and mobile terminating access is applicable, upon which the procedure ends;

5.3.3.9 Abortion of RRC connection establishment

If upper layers abort the RRC connection establishment procedure while the UE has not yet entered RRC_CONNECTED, the UE shall:

> 1> stop timer T300, if running;

> 1> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

5.3.4 Initial security activation

5.3.4.1 General
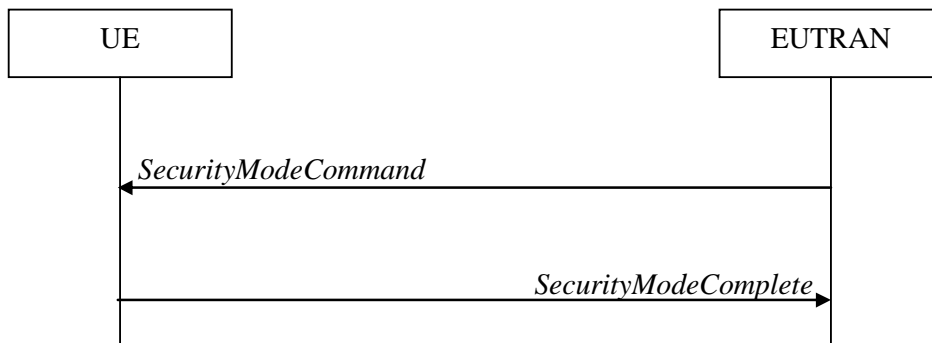
Figure 5.3.4.1-1: Security mode command, successful
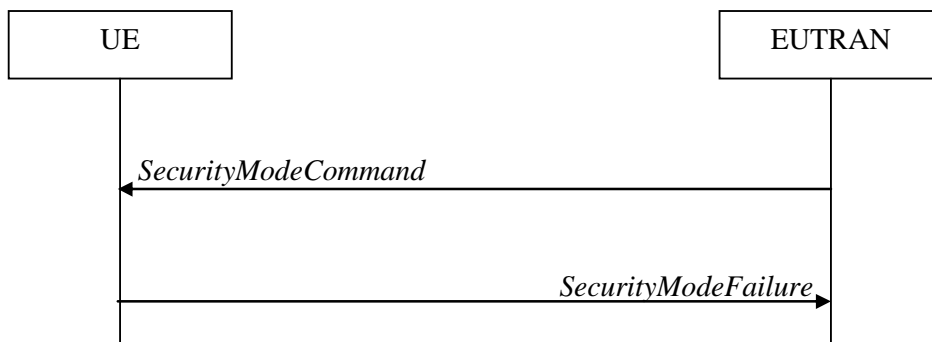
Figure 5.3.4.1-2: Security mode command, failure

The purpose of this procedure is to activate AS security upon RRC connection establishment.

5.3.4.2 Initiation

E-UTRAN initiates the security mode command procedure to a UE in RRC_CONNECTED. Moreover, E-UTRAN applies the procedure as follows:

- when only SRB1 is established, i.e. prior to establishment of SRB2 and/ or DRBs.

5.3.4.3 Reception of the *SecurityModeCommand* by the UE

The UE shall:

1> derive the K_{eNB} key, as specified in TS 33.401 [32];

1> derive the K_{RRCint} key associated with the *integrityProtAlgorithm* indicated in the *SecurityModeCommand* message, as specified in TS 33.401 [32];

1> request lower layers to verify the integrity protection of the *SecurityModeCommand* message, using the algorithm indicated by the *integrityProtAlgorithm* as included in the *SecurityModeCommand* message and the K_{RRCint} key;

1> if the *SecurityModeCommand* message passes the integrity protection check:

2> derive the K_{RRCenc} key and the K_{UPenc} key associated with the *cipheringAlgorithm* indicated in the *SecurityModeCommand* message, as specified in TS 33.401 [32];

2> configure lower layers to apply integrity protection using the indicated algorithm and the K_{RRCint} key immediately, i.e. integrity protection shall be applied to all subsequent messages received and sent by the UE, including the *SecurityModeComplete* message;

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2> configure lower layers to apply ciphering using the indicated algorithm, the K_{RRCenc} key and the K_{UPenc} key after completing the procedure, i.e. ciphering shall be applied to all subsequent messages received and sent by the UE, except for the *SecurityModeComplete* message which is sent unciphered;

2> consider AS security to be activated;

2> submit the *SecurityModeComplete* message to lower layers for transmission, upon which the procedure ends;

1> else:

2> continue using the configuration used prior to the reception of the *SecurityModeCommand* message, i.e. neither apply integrity protection nor ciphering.

2> submit the *SecurityModeFailure* message to lower layers for transmission, upon which the procedure ends;

5.3.5 RRC connection reconfiguration

5.3.5.1 General
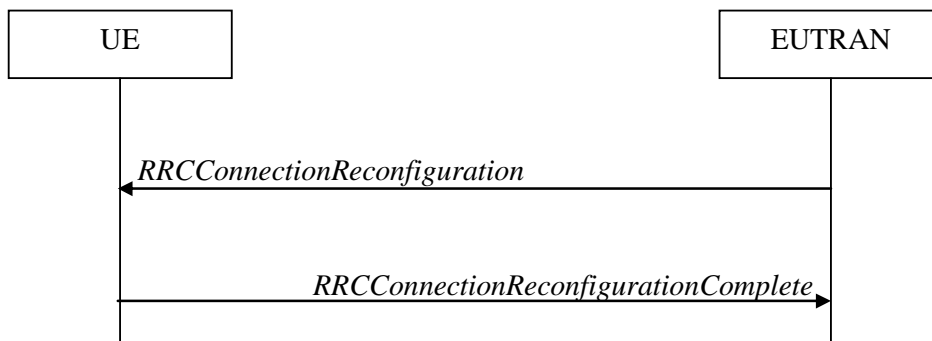
Figure 5.3.5.1-1: RRC connection reconfiguration, successful
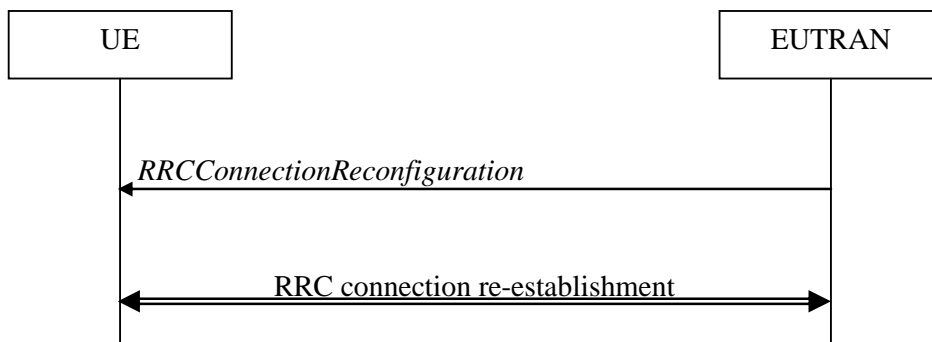
Figure 5.3.5.1-2: RRC connection reconfiguration, failure

The purpose of this procedure is to modify an RRC connection, e.g. to establish/ modify/ release RBs, to perform handover, to setup/ modify/ release measurements. As part of the procedure, NAS dedicated information may be transferred from E-UTRAN to the UE.

5.3.5.2 Initiation

E-UTRAN may initiate the RRC connection reconfiguration procedure to a UE in RRC_CONNECTED. E-UTRAN applies the procedure as follows:

- the *mobilityControlInfo* is included only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;

- the establishment of RBs (other than SRB1, that is established during RRC connection establishment) is included only when AS security has been activated;

5.3.5.3 Reception of an *RRCConnectionReconfiguration* not including the *mobilityControlInfo* by the UE

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

> 1> if this is the first *RRCConnectionReconfiguration* message after successful completion of the RRC Connection Re-establishment procedure:

>> 2> re-establish PDCP for SRB2 and for all DRBs that are established, if any;

>> 2> re-establish RLC for SRB2 and for all DRBs that are established, if any;

>> 2> if the *RRCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

>>> 3> perform the radio resource configuration procedure as specified in 5.3.10;

>> 2> resume SRB2 and all DRBs that are suspended, if any;

> NOTE 1: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

> 1> else:

>> 2> if the *RRCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

>>> 3> perform the radio resource configuration procedure as specified in 5.3.10;

> NOTE 2: If the *RRCConnectionReconfiguration* message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the *SecurityModeComplete* message.

> 1> if the *RRCConnectionReconfiguration* message includes the *dedicatedInfoNASList*:

>> 2> forward each element of the *dedicatedInfoNASList* to upper layers in the same order as listed;

> 1> if the *RRCConnectionReconfiguration* message includes the *measConfig*:

>> 2> perform the measurement configuration procedure as specified in 5.5.2;

> 1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

5.3.5.4 Reception of an *RRCConnectionReconfiguration* including the *mobilityControlInfo* by the UE (handover)

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

> 1> stop timer T310, if running;

> 1> start timer T304 with the timer value set to *t304,* as included in the *mobilityControlInfo*;

> 1> if the *carrierFreq* is included:

>> 2> consider the target cell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

> 1> else:

>> 2> consider the target cell to be one on the current frequency with a physical cell identity indicated by the *targetPhysCellId*;

> 1> start synchronising to the DL of the target cell;

NOTE 1: The UE should perform the handover as soon as possible following the reception of the RRC message triggering the handover, which could be before confirming successful reception (HARQ and ARQ) of this message.

1> reset MAC;

1> re-establish PDCP for all RBs that are established;

NOTE 2: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

1> re-establish RLC for all RBs that are established;

1> apply the value of the *newUE-Identity* as the C-RNTI;

1> configure lower layers in accordance with the received *radioResourceConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *mobilityControlInfo*;

1> if the *RRCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

2> perform the radio resource configuration procedure as specified in 5.3.10;

1> if the *keyChangeIndicator* received in the *securityConfigHO* is set to *TRUE*:

2> update the K_{eNB} key based on the fresh K_{ASME} key taken into use with the previous successful NAS SMC procedure, as specified in TS 33.401 [32];

1> else:

2> update the K_{eNB} key based on the current K_{eNB} or the NH, using the *nextHopChainingCount* value indicated in the *securityConfigHO*, as specified in TS 33.401 [32];

1> store the *nextHopChainingCount* value;

1> if the *securityAlgorithmConfig* is included in the *securityConfigHO*:

2> derive the K_{RRCint} key associated with the *integrityProtAlgorithm*, as specified in TS 33.401 [32];

2> derive the K_{RRCenc} key and the K_{UPenc} key associated with the *cipheringAlgorithm*, as specified in TS 33.401 [32];

1> else:

2> derive the K_{RRCint} key associated with the current integrity algorithm, as specified in TS 33.401 [32];

2> derive the K_{RRCenc} key and the K_{UPenc} key associated with the current ciphering algorithm, as specified in TS 33.401 [32];

1> configure lower layers to apply the integrity protection algorithm and the K_{RRCint} key, i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> configure lower layers to apply the ciphering algorithm, the K_{RRCenc} key and the K_{UPenc} key, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> perform the measurement related actions as specified in 5.5.6.1;

1> if the *RRCConnectionReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

> 2> stop timer T304;

> 2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target cell, if any;

> 2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target cell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target cell;

NOTE 3: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

> 2> the procedure ends;

NOTE 4: The UE is not required to determine the SFN of the target cell by acquiring system information from that cell before performing RACH access in the target cell.

5.3.5.5 Reconfiguration failure

The UE shall:

1> if the UE is unable to comply with (part of) the configuration included in the *RRCConnectionReconfiguration* message:

> 2> continue using the configuration used prior to the reception of *RRCConnectionReconfiguration* message;

> 2> if security has not been activated:

> > 3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

> 2> else:

> > 3> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the connection reconfiguration procedure ends;

NOTE 1: The UE may apply above failure handling also in case the *RRCConnectionReconfiguration* message causes a protocol error for which the generic error handling as defined in 5.7 specifies that the UE shall ignore the message.

NOTE 2: If the UE is unable to comply with part of the configuration, it does not apply any part of the configuration, i.e. there is no partial success/ failure.

5.3.5.6 T304 expiry (handover failure)

The UE shall:

1> if T304 expires (handover failure):

NOTE: Following T304 expiry any dedicated preamble, if provided within the *rach-ConfigDedicated*, is not available for use by the UE anymore.

> 2> revert back to the configuration used in the source cell, excluding the configuration configured by the *physicalConfigDedicated*, the *mac-MainConfig* and the *sps-Config*;

> 2> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the RRC connection reconfiguration procedure ends;

5.3.6   Counter check

5.3.6.1   General
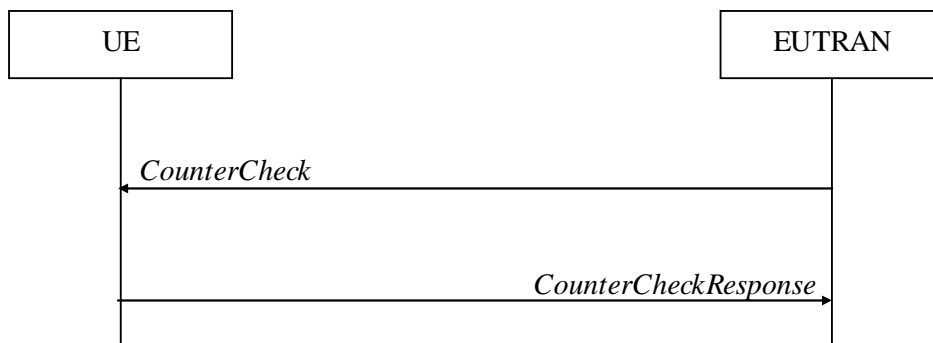
Figure 5.3.6.1-1: Counter check procedure

The counter check procedure is used by E-UTRAN to request the UE to verify the amount of data sent/ received on each DRB. More specifically, the UE is requested to check if, for each DRB, the most significant bits of the COUNT match with the values indicated by E-UTRAN.

> NOTE: The procedure enables E-UTRAN to detect packet insertion by an intruder (a 'man in the middle').

5.3.6.2   Initiation

E-UTRAN initiates the procedure by sending a *CounterCheck* message.

> NOTE: E-UTRAN may initiate the procedure when any of the COUNT values reaches a specific value.

5.3.6.3   Reception of the *CounterCheck* message by the UE

Upon receiving the *CounterCheck* message, the UE shall:

1> for each DRB that is established:

2> if no COUNT exists for a given direction (uplink or downlink) because it is a uni-directional bearer configured only for the other direction:

3> assume the COUNT value to be '0' for the unused direction;

2> if the *drb-Identity* is not included in the *drb-CountMSB-InfoList*:

3> include the DRB in the *drb-CountInfoList* in the *CounterCheckResponse* message by including the *drb-Identity*, the *count-Uplink* and the *count-Downlink* set to the value of the corresponding COUNT;

2> else if, for at least one direction, the most significant bits of the COUNT are different from the value indicated in the *drb-CountMSB-InfoList*:

3> include the DRB in the *drb-CountInfoList* in the *CounterCheckResponse* message by including the *drb-Identity*, the *count-Uplink* and the *count-Downlink* set to the value of the corresponding COUNT;

1> for each DRB that is included in the *drb-CountMSB-InfoList* in the *CounterCheck* message that is not established:

2> include the DRB in the *drb-CountInfoList* in the *CounterCheckResponse* message by including the *drb-Identity*, the *count-Uplink* and the *count-Downlink* with the most significant bits set identical to the corresponding values in the *drb-CountMSB-InfoList* and the least significant bits set to zero;

1> submit the *CounterCheckResponse* message to lower layers for transmission upon which the procedure ends;

5.3.7 RRC connection re-establishment

5.3.7.1 General
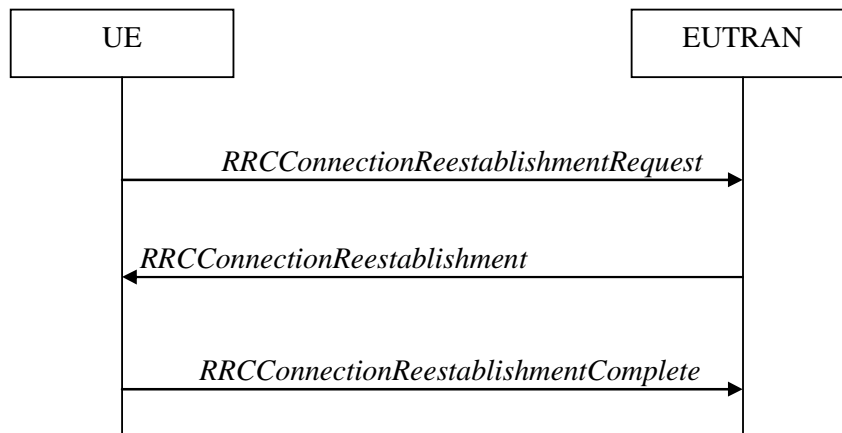
Figure 5.3.7.1-1: RRC connection re-establishment, successful
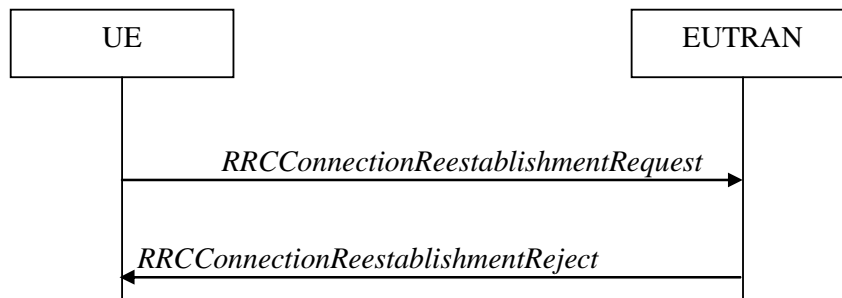
Figure 5.3.7.1-2: RRC connection re-establishment, failure

The purpose of this procedure is to re-establish the RRC connection, which involves the resumption of SRB1 operation and the re-activation of security.

A UE in RRC_CONNECTED, for which security has been activated, may initiate the procedure in order to continue the RRC connection. The connection re-establishment succeeds only if the concerned cell is prepared i.e. has a valid UE context. In case E-UTRAN accepts the re-establishment, SRB1 operation resumes while the operation of other radio bearers remains suspended. If AS security has not been activated, the UE does not initiate the procedure but instead moves to RRC_IDLE directly.

E-UTRAN applies the procedure as follows:

- to reconfigure SRB1 and to resume data transfer only for this RB;

- to re-activate AS security without changing algorithms.

5.3.7.2 Initiation

The UE shall only initiate the procedure when AS security has been activated. The UE initiates the procedure when one of the following conditions is met:

1> upon detecting radio link failure, in accordance with 5.3.11; or

1> upon handover failure, in accordance with 5.3.5.6; or

1> upon mobility from E-UTRA failure, in accordance with 5.4.3.5; or

1> upon integrity check failure indication from lower layers; or

    1> upon an RRC connection reconfiguration failure, in accordance with 5.3.5.5;

Upon initiation of the procedure, the UE shall:

    1> stop timer T310, if running;

    1> start timer T311;

    1> suspend all RBs except SRB0;

    1> reset MAC;

    1> apply the default physical channel configuration as specified in 9.2.4;

    1> apply the default semi-persistent scheduling configuration as specified in 9.2.3;

    1> apply the default MAC main configuration as specified in 9.2.2;

    1> perform cell selection in accordance with the cell selection process as specified in TS 36.304 [4];

5.3.7.3 Actions following cell selection while T311 is running

Upon selecting a suitable E-UTRA cell, the UE shall:

    1> stop timer T311;

    1> start timer T301;

    1> apply the *timeAlignmentTimerCommon* included in *SystemInformationBlockType2*;

    1> initiate transmission of the *RRCConnectionReestablishmentRequest* message in accordance with 5.3.7.4;

    NOTE: This procedure applies also if the UE returns to the source cell.

Upon selecting an inter-RAT cell, the UE shall:

    1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.4 Actions related to transmission of *RRCConnectionReestablishmentRequest* message

The UE shall set the contents of *RRCConnectionReestablishmentRequest* message as follows:

    1> set the *ue-Identity* as follows:

        2> set the *c-RNTI* to the C-RNTI used in the source cell (handover and mobility from E-UTRA failure) or used in the cell in which the trigger for the re-establishment occurred (other cases);

        2> set the *physCellId* to the physical cell identity of the source cell (handover and mobility from E-UTRA failure) or of the cell in which the trigger for the re-establishment occurred (other cases);

        2> set the *shortMAC-I* to the 16 least significant bits of the MAC-I calculated:

            3> over the ASN.1 encoded as per section 8 (i.e., a multiple of 8 bits) *VarShortMAC-Input*;

            3> with the K_{RRCint} key and integrity protection algorithm that was used in the source cell (handover and mobility from E-UTRA failure) or of the cell in which the trigger for the re-establishment occurred (other cases); and

            3> with all input bits for COUNT, BEARER and DIRECTION set to binary ones;

    1> set the *reestablishmentCause* as follows:

        2> if the re-establishment procedure was initiated due to reconfiguration failure as specified in 5.3.5.5 (the UE is unable to comply with the reconfiguration):

    3> set the *reestablishmentCause* to the value '*reconfigurationFailure*';

  2> else if the re-establishment procedure was initiated due to handover failure as specified in 5.3.5.6 (intra-LTE handover failure) or 5.4.3.5 (inter-RAT mobility from EUTRA failure):

    3> set the *reestablishmentCause* to the value '*handoverFailure*';

  2> else:

    3> set the *reestablishmentCause* to the value '*otherFailure*';

The UE shall submit the *RRCConnectionReestablishmentRequest* message to lower layers for transmission.

5.3.7.5 Reception of the *RRCConnectionReestablishment* by the UE

NOTE: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> stop timer T301;

1> re-establish PDCP for SRB1;

1> re-establish RLC for SRB1;

1> perform the radio resource configuration procedure in accordance with the received *radioResourceConfigDedicated* and as specified in 5.3.10;

1> resume SRB1;

NOTE: E-UTRAN should not transmit any message on SRB1 prior to receiving the *RRCConnectionReestablishmentComplete* message.

1> update the K_{eNB} key based on the K_{ASME} key to which the current K_{eNB} is associated, using the *nextHopChainingCount* value indicated in the *RRCConnectionReestablishment* message, as specified in TS 33.401 [32];

1> store the *nextHopChainingCount* value;

1> derive the K_{RRCint} key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32];

1> derive the K_{RRCenc} key and the K_{UPenc} key associated with the previously configured ciphering algorithm, as specified in TS 33.401 [32];

1> configure lower layers to activate integrity protection using the previously configured algorithm and the K_{RRCint} key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> configure lower layers to apply ciphering using the previously configured algorithm, the K_{RRCenc} key and the K_{UPenc} key immediately, i.e., ciphering shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> perform the measurement related actions as specified in 5.5.6.1;

1> submit the *RRCConnectionReestablishmentComplete* message to lower layers for transmission, upon which the procedure ends;

5.3.7.6 T311 expiry

Upon T311 expiry, the UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.7 T301 expiry or selected cell no longer suitable

The UE shall:

> 1> if timer T301 expires; or

> 1> if the selected cell becomes no longer suitable according to the cell selection criteria as specified in TS 36.304 [4]:

>> 2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.8 Reception of *RRCConnectionReestablishmentReject* by the UE

Upon receiving the *RRCConnectionReestablishmentReject* message, the UE shall:

> 1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.8 RRC connection release

5.3.8.1 General
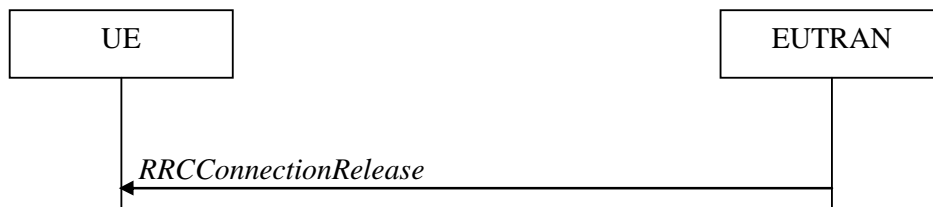
Figure 5.3.8.1-1: RRC connection release, successful

The purpose of this procedure is to release the RRC connection, which includes the release of the established radio bearers as well as all radio resources.

5.3.8.2 Initiation

E-UTRAN initiates the RRC connection release procedure to a UE in RRC_CONNECTED.

5.3.8.3 Reception of the *RRCConnectionRelease* by the UE

The UE shall:

> 1> delay the following actions defined in this sub-clause 60 ms from the moment the *RRCConnectionRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged, whichever is earlier;

> 1> if the *RRCConnectionRelease* message includes the *idleModeMobilityControlInfo*:

>> 2> store the cell reselection priority information provided by the *idleModeMobilityControlInfo*;

>> 2> if the *t320* is included:

>>> 3> start timer T320, with the timer value set according to the value of *t320*;

> 1> else:

>> 2> apply the cell reselection priority information broadcast in the system information;

> 1> if the *releaseCause* received in the *RRCConnectionRelease* message indicates '*loadBalancingTAURequired*':

2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'load balancing TAU required';

1> else:

2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

5.3.8.4 T320 expiry

The UE shall:

1> if T320 expires:

2> if stored, discard the cell reselection priority information provided by the *idleModeMobilityControlInfo* or inherited from another RAT;

2> apply the cell reselection priority information broadcast in the system information;

5.3.9 RRC connection release requested by upper layers

5.3.9.1 General

The purpose of this procedure is to release the RRC connection. Access to the current cell may be barred as a result of this procedure.

NOTE: Upper layers invoke the procedure, e.g. upon determining that the network has failed an authentication check, see TS 24.301 [35].

5.3.9.2 Initiation

The UE initiates the procedure when upper layers request the release of the RRC connection.

The UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

1> if the upper layers indicate barring of the serving cell:

2> treat the cell used prior to entering RRC_IDLE as barred according to TS 36.304 [4];

5.3.10 Radio resource configuration

5.3.10.0 General

The UE shall:

1> if the received *radioResourceConfigDedicated* includes the *srb-ToAddModList*:

2> perform the SRB addition or reconfiguration as specified in 5.3.10.1;

1> if the received *radioResourceConfigDedicated* includes the *drb-ToReleaseList*:

2> perform DRB release as specified in 5.3.10.2;

1> if the received *radioResourceConfigDedicated* includes the *drb-ToAddModList*:

2> perform DRB addition or reconfiguration as specified in 5.3.10.3;

1> if the received *radioResourceConfigDedicated* includes the *mac-MainConfig*:

2> perform MAC main reconfiguration as specified in 5.3.10.4;

1> if the received *radioResourceConfigDedicated* includes *sps-Config*:

   2> perform SPS reconfiguration according to 5.3.10.5;

1> if the received *radioResourceConfigDedicated* includes the *physicalConfigDedicated*:

   2> reconfigure the physical channel configuration as specified in 5.3.10. 6.

5.3.10.1   SRB addition/ modification

The UE shall:

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is not part of the current UE configuration (SRB establishment):

   2> apply the specified configuration defined in 9.1.2 for the corresponding SRB;

   2> establish a PDCP entity and configure it with the current security configuration, if applicable;

   2> establish an RLC entity in accordance with the received *rlc-Config*;

   2> establish a DCCH logical channel in accordance with the received *logicalChannelConfig* and with the logical channel identity set in accordance with 9.1.2;

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is part of the current UE configuration (SRB reconfiguration):

   2> reconfigure the RLC entity in accordance with the received *rlc-Config*;

   2> reconfigure the DCCH logical channel in accordance with the received *logicalChannelConfig*;

5.3.10.2   DRB release

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToReleaseList* that is part of the current UE configuration (DRB release):

   2> release the PDCP entity;

   2> release the RLC entity or entities;

   2> release the DTCH logical channel;

1> if the procedure was triggered due to handover:

   2> indicate the release of the DRB(s) and the *eps-BearerIdentity* of the released DRB(s) to upper layers after successful handover;

1> else:

   2> indicate the release of the DRB(s) and the *eps-BearerIdentity* of the released DRB(s) to upper layers immediately.

NOTE: The UE does not consider the message as erroneous if the *drb-ToReleaseList* includes any *drb-Identity* value that is not part of the current UE configuration.

5.3.10.3   DRB addition/ modification

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment):

   2> establish a PDCP entity and configure it with the current security configuration and in accordance with the received *pdcp-Config*;

   2> establish an RLC entity or entities in accordance with the received *rlc-Config*;

> 2> establish a DTCH logical channel in accordance with the received *logicalChannelIdentity* and the received *logicalChannelConfig*;

> 1> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;

> 1> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration (DRB reconfiguration):

>> 2> if the *pdcp-Config* is included:

>>> 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*;

>> 2> if the *rlc-Config* is included:

>>> 3> reconfigure the RLC entity or entities in accordance with the received *rlc-Config*;

>> 2> if the *logicalChannelConfig* is included:

>>> 3> reconfigure the DTCH logical channel in accordance with the received *logicalChannelConfig*;

> NOTE: Removal and addition of the same *drb-Identity* in single *radioResourceConfiguration* is not supported.

5.3.10.4 MAC main reconfiguration

The UE shall:

> 1> reconfigure the MAC main configuration in accordance with the received *mac-MainConfig*;

5.3.10.5 Semi-persistent scheduling reconfiguration

The UE shall:

> 1> reconfigure the semi-persistent scheduling in accordance with the received *sps-Config*:

5.3.10.6 Physical channel reconfiguration

The UE shall:

> 1> reconfigure the physical channel configuration in accordance with the received *physicalConfigDedicated*;

> 1> if the *antennaInfo* is included and set to '*explicitValue*':

>> 2> if the configured *transmissionMode* is not '*tm3*' or '*tm4*' release *ri-ConfigIndex* in *cqi-ReportPeriodic*, if previously configured;

> 1> else if the *antennaInfo* is included and set to '*defaultValue*':

>> 2> release *ri-ConfigIndex* in *cqi-ReportPeriodic*, if previously configured;

5.3.11 Radio link failure related actions

5.3.11.1 Detection of physical layer problems in RRC_CONNECTED

The UE shall:

> 1> upon receiving N310 consecutive "out-of-sync" indications from lower layers while neither T300, T301, T304 nor T311 is running:

>> 2> start timer T310;

5.3.11.2 Recovery of physical layer problems

Upon receiving N311 consecutive "in-sync" indications from lower layers while T310 is running, the UE shall:

1> stop timer T310;

NOTE 1: In this case, the UE resumes the RRC connection without explicit signalling, i.e. the UE resumes the entire radio resource configuration.

NOTE 2: Periods in time where neither "in-sync" nor "out-of-sync" is reported by layer 1 do not affect the evaluation of the number of consecutive "in-sync" or "out-of-sync" indications.

5.3.11.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry; or

1> upon random access problem indication from MAC while neither T300, T301, T304 nor T311 is running; or

1> upon indication from RLC that the maximum number of retransmissions has been reached:

>   2> consider radio link failure to be detected;

>   2> if AS security has not been activated:

>   >   3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

>   2> else:

>   >   3> initiate the connection re-establishment procedure as specified in 5.3.7;

5.3.12 UE actions upon leaving RRC_CONNECTED

Upon leaving RRC_CONNECTED, the UE shall:

1> reset MAC;

1> stop all timers that are running except T320;

1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity for all established RBs;

1> indicate the release of the RRC connection to upper layers together with the release cause;

1> if leaving RRC_CONNECTED was not triggered by reception of the *MobilityFromEUTRACommand* message:

>   2> enter RRC_IDLE by performing cell selection in accordance with the cell selection process, defined for the case of leaving RRC_CONNECTED, as specified in TS 36.304 [4];

5.3.13 UE actions upon PUCCH/ SRS release request

Upon receiving a PUCCH/ SRS release request from lower layers, the UE shall:

1> apply the default physical channel configuration for *CQI-ReportConfig* as specified in 9.2.4;

1> apply the default physical channel configuration for *soundingRS-UL-ConfigDedicated* as specified in 9.2.4;

1> apply the default physical channel configuration for *schedulingRequestConfig* as specified in 9.2.4;

5.4 Inter-RAT mobility

5.4.1 Introduction

The general principles of connected mode mobility are described in 5.3.1.3. The general principles of the security handling upon connected mode mobility are described in 5.3.1.2.

For the (network controlled) inter RAT mobility from E-UTRA for a UE in RRC_CONNECTED, a single procedure is defined that supports both handover and cell change order with optional network assistance (NACC). In case of mobility to CDMA2000, the eNB decides when to move to the other RAT while the target RAT determines to which cell the UE shall move.

5.4.2 Handover to E-UTRA

5.4.2.1 General
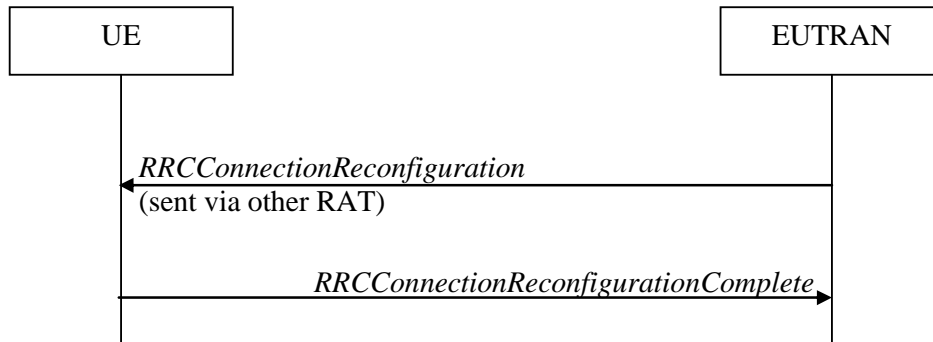
Figure 5.4.2.1-1: Handover to E-UTRA, successful

The purpose of this procedure is to, under the control of the network, transfer a connection between the UE and another Radio Access Network (e.g. GERAN or UTRAN) to E-UTRAN.

The handover to E-UTRA procedure applies when SRBs, possibly in combination with DRBs, are established in another RAT. Handover from UTRAN to E-UTRAN applies only after integrity has been activated in UTRAN.

5.4.2.2 Initiation

The RAN using another RAT initiates the Handover to E-UTRA procedure, in accordance with the specifications applicable for the other RAT, by sending the *RRCConnectionReconfiguration* message via the radio access technology from which the inter-RAT handover is performed.

E-UTRAN applies the procedure as follows:

- to activate ciphering, possibly using NULL algorithm, if not yet activated in the other RAT;

- to establish SRB1, SRB2 and one or more DRBs, i.e. at least the DRB associated with the default EPS bearer is established;

5.4.2.3 Reception of the *RRCConnectionReconfiguration* by the UE

If the UE is able to comply with the configuration included in the *RRCConnectionReconfiguration* message, the UE shall:

1> apply the default physical channel configuration as specified in 9.2.4;

1> apply the default semi-persistent scheduling configuration as specified in 9.2.3;

1> apply the default MAC main configuration as specified in 9.2.2;

1> start timer T304 with the timer value set to *t304,* as included in the *mobilityControlInfo*;

1> consider the target cell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

1> start synchronising to the DL of the target cell;

1> set the C-RNTI to the value of the *newUE-Identity*;

1> for the target cell, apply the downlink bandwidth indicated by the *dl-Bandwidth;*

1> for the target cell, apply the uplink bandwidth indicated by (the absence or presence of) the *ul-Bandwidth;*

1> perform the radio resource configuration procedure as specified in 5.3.10;

1> forward the *nas-SecurityParamToEUTRA* to the upper layers;

1> derive the K_{eNB} key, as specified in TS 33.401 [32];

1> store the *nextHopChainingCount* value;

1> derive the K_{RRCint} key associated with the *integrityProtAlgorithm*, as specified in TS 33.401 [32];

1> derive the K_{RRCenc} key and the K_{UPenc} key associated with the *cipheringAlgorithm*, as specified in TS 33.401 [32];

1> configure lower layers to apply the indicated integrity protection algorithm and the K_{RRCint} key immediately, i.e. the indicated integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> configure lower layers to apply the indicated ciphering algorithm, the K_{RRCenc} key and the K_{UPenc} key immediately, i.e. the indicated ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> if the *RRCConnectionReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration;

1> use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;

1> if MAC successfully completes the random access procedure:

2> stop timer T304;

2> apply the parts of the configuration that do not require the UE to know the SFN of the target cell;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target cell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target cell;

2> enter E-UTRA RRC_CONNECTED, upon which the procedure ends;

Editor's note: The handling of outstanding signalling/ data may need to be clarified.

5.4.2.4 Reconfiguration failure

The UE shall:

1> if the UE is unable to comply with (part of) the configuration included in the *RRCConnectionReconfiguration* message:

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

NOTE 1: The UE may apply above failure handling also in case the *RRCConnectionReconfiguration* message causes a protocol error for which the generic error handling as defined in 5.7 specifies that the UE shall ignore the message.

NOTE 2: If the UE is unable to comply with part of the configuration, it does not apply any part of the configuration, i.e. there is no partial success/ failure.

5.4.2.5 T304 expiry (handover to E-UTRA failure)

The UE shall:

1> upon T304 expiry (handover to E-UTRA failure):

2> reset MAC;

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

5.4.3 Mobility from E-UTRA

5.4.3.1 General
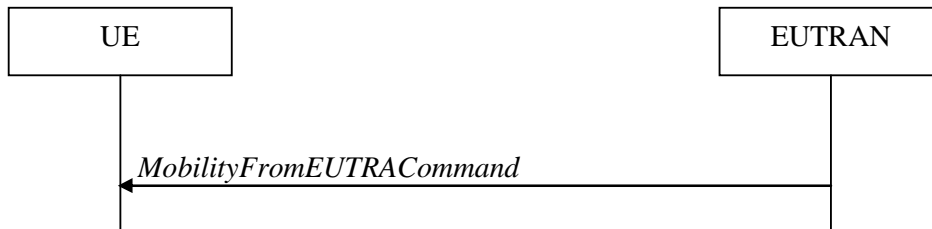
Figure 5.4.3.1-1: Mobility from E-UTRA, successful
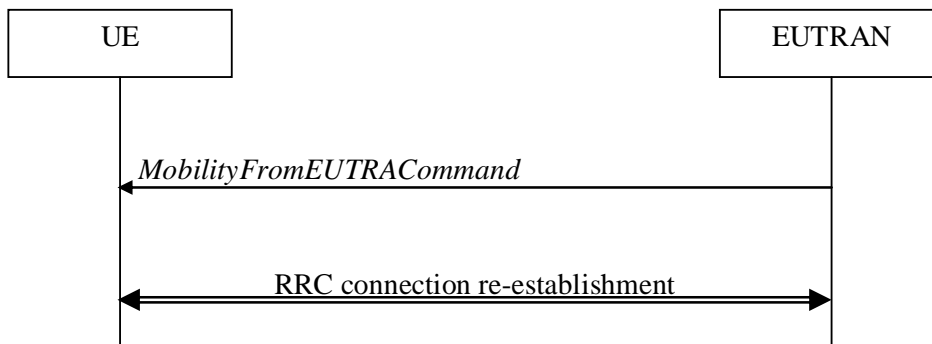
Figure 5.4.3.1-2: Mobility from E-UTRA, failure

The purpose of this procedure is to move a UE in RRC_CONNECTED to a cell using another Radio Access Technology (RAT), e.g. GERAN, UTRA or CDMA2000 systems. The mobility from E-UTRA procedure covers both:

- handover, i.e. the *MobilityFromEUTRACommand* message includes radio resources that have been allocated for the UE in the target cell; and

- cell change order, i.e. the *MobilityFromEUTRACommand* message may include information facilitating access of and/ or connection establishment in the target cell, e.g. system information. Cell change order is applicable only to GERAN.

5.4.3.2 Initiation

E-UTRAN initiates the mobility from E-UTRA procedure to a UE in RRC_CONNECTED, possibly in response to a *MeasurementReport* message, by sending a *MobilityFromEUTRACommand* message. E-UTRAN applies the procedure as follows:

- the procedure is initiated only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;

5.4.3.3 Reception of the *MobilityFromEUTRACommand* by the UE

The UE shall be able to receive a *MobilityFromEUTRACommand* message and perform a cell change order to GERAN, even if no prior UE measurements have been performed on the target cell.

The UE shall:

1> stop timer T310, if running;

1> if the *MobilityFromEUTRACommand* message includes the *purpose* set to '*handover*':

2> if the *targetRAT-Type* is set to '*utra*' or '*geran*':

    3> consider inter-RAT mobility as initiated towards the RAT indicated by the *targetRAT-Type* included in the *MobilityFromEUTRACommand* message;

    3> forward the *nas-SecurityParamFromEUTRA* to the upper layers;

    3> access the target cell indicated in the inter-RAT message in accordance with the specifications of the target RAT;

    3> if the *targetRAT-Type* is set to '*geran*':

        4> use the contents of *systemInformation*, if provided for PS Handover, as the system information to begin access on the target GERAN cell;

NOTE 1: If there are DRBs for which no radio bearers are established in the target RAT as indicated in the *targetRAT-MessageContainer* in the message, the E-UTRA RRC part of the UE does not indicate the release of the concerned DRBs to the upper layers. Upper layers may derive which bearers are not established from information received from the AS of the target RAT.

NOTE 2: In case of SR-VCC, the DRB to be replaced is specified in [51].

  2> else if the *targetRAT-Type* is set to '*cdma2000-1XRTT*' or '*cdma2000-HRPD*':

    3> forward the *targetRAT-Type* and the *targetRAT-MessageContainer* to the CDMA2000 upper layers for the UE to access the cell indicated in the inter-RAT message in accordance with the specifications of the CDMA2000 target-RAT;

1> else if the *MobilityFromEUTRACommand* message includes the *purpose* set to '*cellChangeOrder*':

  2> start timer T304 with the timer value set to *t304,* as included in the *MobilityFromEUTRACommand* message;

  2> if the *targetRAT-Type* is set to '*geran*':

    3> if *networkControlOrder* is included in the *MobilityFromEUTRACommand* message:

        4> apply the value as specified in TS 44.060 [36];

    3> else:

        4> acquire *networkControlOrder* and apply the value as specified in TS 44.060 [36];

    3> use the contents of *systemInformation*, if provided, as the system information to begin access on the target GERAN cell;

  2> establish the connection to the target cell indicated in the *CellChangeOrder*;

NOTE 3: The criteria for success or failure of the cell change order to GERAN are specified in TS 44.060[36].

5.4.3.4 Successful completion of the mobility from E-UTRA

Upon successfully completing the handover or the cell change order, the UE shall:

  1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

  1> stop timer T304, if running;

5.4.3.5 Mobility from E-UTRA failure

The UE shall:

  1> if T304 expires (mobility from E-UTRA failure); or

  1> if the UE does not succeed in establishing the connection to the target radio access technology; or

1> if the UE is unable to comply with (part of) the configuration included in the *MobilityFromEUTRACommand* message; or

1> if there is a protocol error in the inter RAT information included in the *MobilityFromEUTRACommand* message, causing the UE to fail the procedure according to the specifications applicable for the target RAT:

> 2> stop T304, if running;

> 2> if the *cs-FallbackIndicator* in the *MobilityFromEUTRACommand* message was set to '*TRUE*':

>> 3> indicate to upper layers that the CS Fallback procedure has failed;

> 2> revert back to the configuration used in the source cell, excluding the configuration configured by the *physicalConfigDedicated*, *mac-MainConfig* and *sps-Config*;

> 2> initiate the connection re-establishment procedure as specified in 5.3.7;

5.4.4 Handover from E-UTRA preparation request (CDMA2000)

5.4.4.1 General
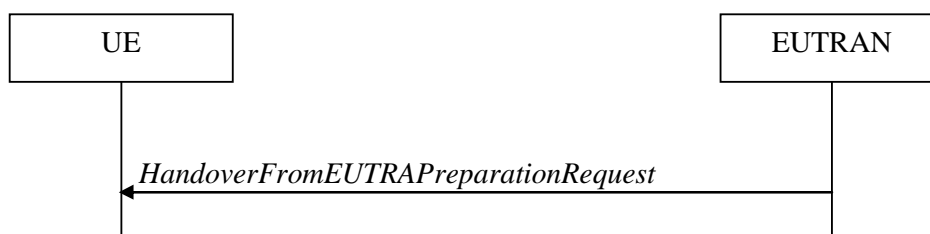
Figure 5.4.4.1-1: Handover from E-UTRA preparation request

The purpose of this procedure is to trigger the UE to prepare for handover to CDMA2000 by requesting a connection with this network. This procedure applies to CDMA2000 capable UEs only.

The handover from E-UTRA preparation request procedure applies when signalling radio bearers are established.

5.4.4.2 Initiation

E-UTRAN initiates the handover from E-UTRA preparation request procedure to a UE in RRC_CONNECTED, possibly in response to a *MeasurementReport* message, by sending a *HandoverFromEUTRAPreparationRequest* message. E-UTRA initiates the procedure only when AS security has been activated.

5.4.4.3 Reception of the *HandoverFromEUTRAPreparationRequest* by the UE

Upon reception of the *HandoverFromEUTRAPreparationRequest* message, the UE shall:

1> indicate the request to prepare handover and forward the *cdma2000-Type* to the CDMA2000 upper layers;

1> if *cdma2000-Type* is set to '*type1XRTT*':

> 2> forward the *rand* and the *mobilityParametersCDMA2000* to the CDMA2000 upper layers;

5.4.5 UL handover preparation transfer (CDMA2000)

5.4.5.1 General

Figure 5.4.5.1-1: UL handover preparation transfer

The purpose of this procedure is to tunnel the handover related CDMA2000 dedicated information from UE to E-UTRAN when requested by the higher layers. The procedure is triggered by the higher layers on receipt of *HandoverFromEUTRAPreparationRequest* message. This procedure applies to CDMA2000 capable UEs only.

5.4.5.2 Initiation

A UE in RRC_CONNECTED initiates the UL Handover Preparation Transfer procedure whenever there is a need to transfer handover related non-3GPP dedicated information. The UE initiates the UL handover preparation transfer procedure by sending the *ULHandoverPreparationTransfer* message.

5.4.5.3 Actions related to transmission of the *ULHandoverPreparationTransfer* message

The UE shall set the contents of the *ULHandoverPreparationTransfer* message as follows:

> 1> include the *cdma2000-Type* and the *dedicatedInfoCDMA2000*;

> 1> if the *cdma2000-Type* is set to '*type1XRTT*':

>> 2> include the *meid* and set it to the value received from the CDMA2000 upper layers;

> 1> submit the *ULHandoverPreparationTransfer* message to lower layers for transmission, upon which the procedure ends;

5.4.5.4 Failure to deliver the *ULHandoverPreparationTransfer* message

The UE shall:

> 1> if the UE is unable to guarantee successful delivery of *ULHandoverPreparationTransfer* messages:

>> 2> inform upper layers about the possible failure to deliver the information contained in the concerned *ULHandoverPreparationTransfer* message;

5.4.6 Inter-RAT cell change order to E-UTRAN

5.4.6.1 General

The purpose of the inter-RAT cell change order to E-UTRAN procedure is to transfer, under the control of the source radio access technology, a connection between the UE and another radio access technology (e.g. GSM/ GPRS) to E-UTRAN.

5.4.6.2 Initiation

The procedure is initiated when a radio access technology other than E-UTRAN, e.g. GSM/GPRS, using procedures specific for that RAT, orders the UE to change to an E-UTRAN cell. In response, upper layers request the establishment of an RRC connection as specified in subclause 5.3.3.

NOTE: Within the message used to order the UE to change to an E-UTRAN cell, the source RAT should specify the identity of the target E-UTRAN cell as specified in the specifications for that RAT.

The UE shall:

1> upon receiving an *RRCConnectionSetup* message:

2> consider the inter-RAT cell change order procedure to have completed succesfully;

5.4.6.3 UE fails to complete an inter-RAT cell change order

If the inter-RAT cell change order fails the UE shall return to the other radio access technology and proceed as specified in the appropriate specifications for that RAT.

The UE shall:

1> upon failure to establish the RRC connection as specified in subclause 5.3.3:

2> consider the inter-RAT cell change order procedure to have failed;

NOTE: The cell change was network ordered. Therefore, failure to change to the target cell should not cause the UE to move to UE-controlled cell selection.

5.5 Measurements

5.5.1 Introduction

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the *RRCConnectionReconfiguration* message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency of the serving cell.

- Inter-frequency measurements: measurements at frequencies that differ from the downlink carrier frequency of the serving cell.

- Inter-RAT measurements of UTRA frequencies.

- Inter-RAT measurements of GERAN frequencies.

- Inter-RAT measurements of CDMA2000 HRPD or CDMA2000 1xRTT frequencies.

The measurement configuration includes the following parameters:

1. **Measurement objects:** The objects on which the UE shall perform the measurements.

    - For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets and a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.

    - For inter-RAT UTRA measurements a measurement object is a set of cells on a single UTRA carrier frequency.

    - For inter-RAT GERAN measurements a measurement object is a set of GERAN carrier frequencies.

- For inter-RAT CDMA2000 measurements a measurement object is a set of cells on a single (HRPD or 1xRTT) carrier frequency.

2. **Reporting configurations**: A list of reporting configurations where each reporting configuration consists of the following:

   - Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.

   - Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).

3. **Measurement identities**: A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations:** One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity.

5. **Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

E-UTRAN only configures a single measurement object for a given frequency, i.e. it is not possible to configure two or more measurement objects for the same frequency with different associated parameters, e.g. different offsets and/ or blacklists. E-UTRAN may configure multiple instances of the same event e.g. by configuring two reporting configurations with different thresholds.

The UE maintains a single measurement object list, a single reporting configuration list, and a single measurement identities list. The measurement object list includes measurement objects, that are specified per RAT type, possibly including an intra-frequency object (i.e. the object corresponding to the serving frequency), inter-frequency object(s) and inter-RAT objects. Similarly, the reporting configuration list includes E-UTRA and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

The measurement procedures distinguish the following types of cells:

1. The serving cell.

2. Listed cells - these are cells listed within the measurement object(s).

3. Detected cells - these are cells that are not listed within the measurement object(s) but are detected by the UE on the carrier frequency(ies) indicated by the measurement object(s).

For E-UTRA, the UE measures and reports on the serving cell, listed cells and detected cells. For inter-RAT UTRA, the UE measures and reports on listed cells. For inter-RAT GERAN, the UE measures and reports on detected cells. For inter-RAT CDMA2000, the UE measures and reports on listed cells.

NOTE 1:   For inter-RAT UTRA and CDMA2000, the UE measures and reports also on detected cells for the purpose of SON.

NOTE 2:   This specification is based on the assumption that CSG cells of home deployment type are not indicated within the neighbour list. Furthermore, the assumption is that for non-home deployments, the physical cell identity is unique within the area of a large macro cell (i.e. as for UTRAN).

Whenever the procedural specification, other than contained in sub-clause 5.5.2, refers to a field it concerns a field included in the *VarMeasConfig* unless explictly stated otherwise i.e. only the measurement configuration procedure covers the direct UE action related to the received *measConfig*.

5.5.2 Measurement configuration

5.5.2.1 General

E-UTRAN applies the procedure as follows:

- to ensure that, whenever the UE has a *measConfig*, it includes a *measObject* for the serving frequency;

- to configure at most one measurement identity using a reporting configuration with the *purpose* set to 'reportCGI';

The UE shall:

1> if the received *measConfig* includes the *measObjectToRemoveList*:

2> perform the measurement object removal procedure as specified in 5.5.2.4;

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/ modification procedure as specified in 5.5.2.5;

1> if the received *measConfig* includes the *reportConfigToRemoveList*:

2> perform the reporting configuration removal procedure as specified in 5.5.2.6;

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/ modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2;

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/ modification procedure as specified in 5.5.2.3;

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

1> if the received *measConfig* includes the *s-Measure*:

2> set the parameter *s-Measure* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-Measure*;

1> if the received *measConfig* includes the *preRegistrationInfoHRPD*:

2> forward the *preRegistrationInfoHRPD* to CDMA2000 upper layers;

1> if the received *measConfig* includes the *speedStatePars*:

2> set the parameter *speedStatePars* within *VarMeasConfig* to the received value of *speedStatePars*;

5.5.2.2 Measurement identity removal

The UE shall:

1> for each *measId* included in the received *measIdToRemoveList* that is part of the current UE configuration in *varMeasConfig*:

2> remove the entry with the matching *measId* from the *measIdList* within the *VarMeasConfig*;

2> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;

2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

NOTE: The UE does not consider the message as erroneous if the *measIdToRemoveList* includes any *measId* value that is not part of the current UE configuration.

5.5.2.3   Measurement identity addition/ modification

E-UTRAN applies the procedure as follows:

- configure a *measId* only if the corresponding measurement object, the corresponding reporting configuration and the corresponding quantity configuration, are configured;

The UE shall:

1> for each *measId* included in the received *measIdToAddModList*:

   2> if an entry with the matching *measId* exists in the *measIdList* within the *VarMeasConfig*:

       3> replace the entry with the value received for this *measId*;

   2> else:

       3> add a new entry for this *measId* within the *VarMeasConfig* ;

   2> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;

   2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

   2> if the *triggerType* is set to '*periodical*' and the *purpose* is set to '*reportCGI*' in the *reportConfig* associated with this *measId*:

       3> if the *measObject* associated with this *measId* concerns E-UTRA:

           4> start timer T321 with the timer value set to 1 second for this *measId*;

       3> else:

           4> start timer T321 with the timer value set to 8 seconds for this *measId*;

5.5.2.4   Measurement object removal

The UE shall:

1> for each *measObjectId* included in the received *measObjectToRemoveList* that is part of the current UE configuration in *varMeasConfig*:

   2> remove the entry with the matching *measObjectId* from the *measObjectList* within the *VarMeasConfig*;

   2> remove all *measId* associated with this *measObjectId* from the *measIdList* within the *VarMeasConfig,* if any;

   2> if a *measId* is removed from the *measIdList:*

       3> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;

       3> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

NOTE: The UE does not consider the message as erroneous if the *measObjectToRemoveList* includes any *measObjectId* value that is not part of the current UE configuration.

5.5.2.5 Measurement object addition/ modification

The UE shall:

1> for each *measObjectId* included in the received *measObjectToAddModList*:

    2> if an entry with the matching *measObjectId* exists in the *measObjectList* within the *VarMeasConfig*, for this entry:

        3> replace the entry with the value received for this *measObject*, except for the fields *cellsToAddModList*, *blackCellsToAddModList*, *cellsToRemoveList* and *blackCellsToRemoveList*:

        3> if the received *measObject* includes the *cellsToRemoveList*:

            4> for each *cellIndex* included in the *cellsToRemoveList*:

                5> remove the entry with the matching *cellIndex* from the *cellsToAddModList*;

        3> if the received *measObject* includes the *cellsToAddModList*:

            4> for each *cellIndex* value included in the *cellsToAddModList*:

                5> if an entry with the matching *cellIndex* exists in the *cellsToAddModList*:

                    6> replace the entry with the value received for this *cellIndex*;

                5> else:

                    6> add a new entry for the received *cellIndex* to the *cellsToAddModList*;

        3> if the received *measObject* includes the *blackCellsToRemoveList*:

            4> for each *cellIndex* included in the *blackCellsToRemoveList*:

                5> remove the entry with the matching *cellIndex* from the *blackCellsToAddModList*;

        3> if the received *measObject* includes the *blackCellsToAddModList*:

            4> for each *cellIndex* included in the *blackCellsToAddModList*:

                5> if an entry with the matching *cellIndex* is included in the *blackCellsToAddModList*:

                    6> replace the entry with the value received for this *cellIndex*;

                5> else:

                    6> add a new entry for the received *cellIndex* to the *blackCellsToAddModList*;

        3> for each *measId* associated with this *measObjectId* in the *measIdList* within the *VarMeasConfig*, if any:

            4> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;

            4> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

    2> else:

        3> add a new entry for the received *measObject* to the *measObjectList* within *VarMeasConfig*;

5.5.2.6 Reporting configuration removal

The UE shall:

1> for each *reportConfigId* included in the received *reportConfigToRemoveList* that is part of the current UE configuration in *varMeasConfig*:

    2> remove the entry with the matching *reportConfigId* from the *reportConfigList* within the *VarMeasConfig*;

    2> remove all *measId* associated with the *reportConfigId* from the *measIdList* within the *VarMeasConfig*, if any;

    2> if a *measId* is removed from the *measIdList*:

        3> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;

        3> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

  NOTE: The UE does not consider the message as erroneous if the *reportConfigToRemoveList* includes any *reportConfigId* value that is not part of the current UE configuration.

5.5.2.7   Reporting configuration addition/ modification

The UE shall:

  1> for each *reportConfigId* included in the received *reportConfigToAddModList*:

    2> if an entry with the matching *reportConfigId* exists in the *reportConfigList* within the *VarMeasConfig*, for this entry:

        3> replace the entry with the value received for this *reportConfig*;

        3> for each *measId* associated with this *reportConfigId* included in the *measIdList* within the *VarMeasConfig*, if any:

            4> remove the measurement reporting entry for this *measId* from in *VarMeasReportList*, if included;

            4> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

    2> else:

        3> add a new entry for the received *reportConfig* to the *reportConfigList* within the *VarMeasConfig*;

5.5.2.8   Quantity configuration

The UE shall:

  1> for each RAT for which the received *quantityConfig* includes parameter(s):

    2> set the corresponding parameter(s) in *quantityConfig* within *VarMeasConfig* to the value of the received *quantityConfig* parameter(s);

  1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

    2> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;

    2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;

5.5.2.9   Measurement gap configuration

The UE shall:

  1> if *measGapConfig* is set to '*setup*':

    2> if a measurement gap configuration is already setup, release the measurement gap configuration;

    2> setup the measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., each gap starts at an SFN and subframe meeting the following condition:

        SFN mod T = FLOOR(*gapOffset*/10);

        subframe = *gapOffset* mod 10;

with *T* = MGRP/10 as defined in TS 36.133 [16];

 1> else:

  2> release the measurement gap configuration;

5.5.3 Performing measurements

5.5.3.1 General

The UE supports measurements using a reporting configuration with the *purpose* set to '*reportCGI*', if the network provides sufficient idle periods.

The UE applies the layer 3 filtering as specified in 5.5.3.2, before using the measured results for evaluation of reporting criteria or for measurement reporting.

The UE shall:

 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

  2> if a measurement gap configuration is setup; or

  2> the UE does not require measurement gaps to perform the concerned measurement:

   3> if *s-Measure* is not configured; or

   3> if *s-Measure* is configured and the serving cell RSRP, after layer 3 filtering, is lower than this value; or

   3> if the *purpose* for the associated *reportConfig* is set to '*reportCGI*':

    4> perform the corresponding measurements of neighbouring cells on the frequencies and RATs indicated in the concerned *measObject*;

  2> perform the evaluation of reporting criteria as specified in section 5.5.4;

 1> if a *measId* is configuredfor which the *purpose* within the associated *reportConfig* is set to '*reportCGI*':

  2> try to acquire the global cell identity of the cell indicated by the *cellForWhichToReportCGI* in the associated *measObject* by acquiring the relevant system information from the concerned cell;

  2> if the cell indicated by the *cellForWhichToReportCGI* included in the associated *measObject* is an E-UTRAN cell:

   3> try to acquire the list of additional PLMN Identities, as included in the *plmn-IdentityList*, if multiple PLMN identities are broadcast in the concerned cell;

 NOTE: The 'primary' PLMN is part of the global cell identity.

  2> if the cell indicated by the *cellForWhichToReportCGI* included in the associated *measObject* is a UTRAN cell:

   3> try to acquire the LAC, the RAC and the list of additional PLMN Identities, if multiple PLMN identities are broadcast in the concerned cell;

  2> if the cell indicated by the *cellForWhichToReportCGI* included in the associated *measObject* is a GERAN cell:

   3> try to acquire the RAC in the concerned cell;

  2> if the cell indicated by the *cellForWhichToReportCGI* included in the associated *measObject* is a CDMA2000 cell and the *cdma2000-Type* included in the *measObject* is '*typeHRPD*':

   3> try to acquire the Sector ID in the concerned cell;

  2> if the cell indicated by the *cellForWhichToReportCGI* included in the associated *measObject* is a CDMA2000 cell and the *cdma2000-Type* included in the *measObject* is '*type1XRTT*':

> 3> try to acquire the BASE ID, SID and NID in the concerned cell;

5.5.3.2   Layer 3 filtering

The UE shall:

> 1> for each measurement quantity that the UE performs measurements according to 5.5.3.1:

> > 2> filter the measured result, before using for evaluation of reporting criteria or for measurement reporting, by the following formula:

$$F_n = (1 - a) \cdot F_{n-1} + a \cdot M_n$$

> > where

> > > M_n is the latest received measurement result from the physical layer;

> > > F_n is the updated filtered measurement result, that is used for evaluation of reporting criteria or for measurement reporting;

> > > F_{n-1} is the old filtered measurement result, where F_0 is set to M_1 when the first measurement result from the physical layer is received; and

> > > $a = 1/2^{(k/4)}$, where k is the *filterCoefficent* for the corresponding measurement quantity received by the *quantityConfig*;

> > 2> adapt the filter such that the time characteristics of the filter are preserved at different input rates, observing that the *filterCoefficent* k assumes a sample rate equal to 200 ms;

> NOTE 1:   If k is set to 0, no layer 3 filtering is applicable.

> NOTE 2:   The filtering is performed in the same domain as used for evaluation of reporting criteria or for measurement reporting, i.e., logarithmic filtering for logarithmic measurements.

> NOTE 3:   The filter input rate is implementation dependent, to fulfil the performance requirements set in [16]. For further details about the physical layer measurements, see TS 36.133 [16].

5.5.4   Measurement report triggering

5.5.4.1   General

The UE shall:

> 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

> > 2> if the corresponding *reportConfig* includes a purpose set to '*reportStrongestCellsForSON*':

> > > 3> consider any neighbouring cell detected on the associated frequency to be applicable;

> > 2> else if the corresponding *reportConfig* includes a purpose set to '*reportCGI*':

> > > 3> consider any neighbouring cell detected on the associated frequency/ set of frequencies (GERAN) which has a physical cell identity matching the value of the *cellForWhichToReportCGI* included in the corresponding *measObject* within the *VarMeasConfig* to be applicable;

> > 2> else:

> > > 3> if the corresponding *measObject* concerns E-UTRA:

> > > > 4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

> > > 3> else if the corresponding *measObject* concerns UTRA or CDMA2000:

4> consider a neighbouring cell on the associated frequency to be applicable when the concerned cell is included in the *cellsToAddModList* defined within the *VarMeasConfig* for this *measId* (i.e. the cell is included in the white-list);

3> else if the corresponding *measObject* concerns GERAN:

4> consider a neighbouring cell on the associated set of frequencies to be applicable when the concerned cell matches the *ncc-Permitted* defined within the *VarMeasConfig* for this *measId*;

2> if the *triggerType* is set to 'event' and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include an measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *triggerType* is set to 'event' and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *triggerType* is set to 'event' and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

2> if the *purpose* is included and set to '*reportStrongestCells*' or to '*reportStrongestCellsForSON*' and if a (first) measurement result is available for one or more applicable cells:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

NOTE 1: If the *purpose* is set to '*reportStrongestCells*', the UE initiates a first measurement report immediately after the quantity to be reported becomes available for at least either serving cell or one of the applicable cells. If the purpose is set to '*reportStrongestCellsForSON*', the UE initiates a first measurement report when it has determined the strongest cells on the associated frequency.

2> upon expiry of the periodical reporting timer for this *measId*:

  3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *purpose is* included and set to '*reportCGI*' and if the UE acquired the information needed to set all fields of *cgi-Info* for the requested cell:

  3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

  3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

  3> stop timer T321;

  3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> upon expiry of the T321 for this *measId*:

  3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

  3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

  3> initiate the measurement reporting procedure, as specified in 5.5.5;

NOTE 2: The UE does not stop the periodical reporting with *triggerType* set to '*event*' or to '*periodical*' while the corresponding measurement is not performed due to the serving cell RSRP being equal to or better than *s-Measure* or due to the measurement gap not being setup.

NOTE 3: If the UE is configured with DRX, the UE may delay the measurement reporting for event triggered and periodical triggered measurements until the Active Time, which is defined in TS 36.321 [6].

5.5.4.2 Event A1 (Serving becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A1-2, as specified below, is fulfilled;

Inequality A1-1 (Entering condition)

$Ms - Hys > Thresh$

Inequality A1-2 (Leaving condition)

$Ms + Hys < Thresh$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

Thresh is the threshold parameter for this event (i.e. *a1-Threshold* as defined within *reportConfigEUTRA* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Hys is expressed in dB.

Thresh is expressed in the same unit as *Ms*.

5.5.4.3 Event A2 (Serving becomes worse than threshold)

The UE shall:

> 1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;

> 1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;

Inequality A2-1 (Entering condition)

$$Ms + Hys < Thresh$$

Inequality A2-2 (Leaving condition)

$$Ms - Hys > Thresh$$

The variables in the formula are defined as follows:

> **Ms** is the measurement result of the serving cell, not taking into account any offsets.

> **Hys** is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

> **Thresh** is the threshold parameter for this event (i.e. *a2-Threshold* as defined within *reportConfigEUTRA* for this event).

> **Ms** is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

> **Hys** is expressed in dB.

> **Thresh** is expressed in the same unit as **Ms**.

5.5.4.4 Event A3 (Neighbour becomes offset better than serving)

The UE shall:

> 1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

> 1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Ms + Ofs + Ocs + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Ms + Ofs + Ocs + Off$$

The variables in the formula are defined as follows:

> **Mn** is the measurement result of the neighbouring cell, not taking into account any offsets.

> **Ofn** is the frequency specific offset of the frequency of the neighbour cell (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell).

> **Ocn** is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

> **Ms** is the measurement result of the serving cell, not taking into account any offsets.

> **Ofs** is the frequency specific offset of the serving frequency (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the serving frequency).

> **Ocs** is the cell specific offset of the serving cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the serving frequency), and is set to zero if not configured for the serving cell.

> **Hys** is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigEUTRA* for this event).

Mn, Ms are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ofn, Ocn, Ofs, Ocs, Hys, Off are expressed in dB.

5.5.4.5 Event A4 (Neighbour becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A4-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled;

Inequality A4-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Thresh$$

Inequality A4-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the frequency specific offset of the frequency of the neighbour cell (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

Thresh is the threshold parameter for this event (i.e. *a4-Threshold* as defined within *reportConfigEUTRA* for this event).

Mn is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ofn, Ocn, Hys are expressed in dB.

Thresh is expressed in the same unit as *Ms*.

5.5.4.6 Event A5 (Serving becomes worse than threshold1 and neighbour becomes better than threshold2)

The UE shall:

1> consider the entering condition for this event to be satisfied when both conditions A5-1 and condition A5-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality A5-1 (Entering condition 1)

$$Ms + Hys < Thresh1$$

Inequality A5-2 (Entering condition 2)

$$Mn + Ofn + Ocn - Hys > Thresh2$$

Inequality A5-3 (Leaving condition 1)

$$Ms - Hys > Thresh1$$

Inequality A5-4 (Leaving condition 2)

$$Mn + Ofn + Ocn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the frequency specific offset of the frequency of the neighbour cell (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

Thresh1 is the threshold parameter for this event (i.e. *a5-Threshold1* as defined within *reportConfigEUTRA* for this event).

Thresh2 is the threshold parameter for this event (i.e. *a5-Threshold2* as defined within *reportConfigEUTRA* for this event).

Mn, Ms are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ofn, Ocn, Hys are expressed in dB.

Thresh1 is expressed in the same unit as **Ms**.

Thresh2 is expressed in the same unit as **Mn**.

5.5.4.7 Event B1 (Inter RAT neighbour becomes better than threshold)

The UE shall:

1> for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;

1> consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

$$Mn + Ofn - Hys > Thresh$$

Inequality B1-2 (Leaving condition)

$$Mn + Ofn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, *pilotStrength* is divided by -2.

Ofn is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the neighbour inter-RAT cell).

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh is the threshold parameter for this event (i.e. *b1-Threshold* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b1-Threshold* is divided by -2.

Mn is expressed in dBm or in dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn, Hys are expressed in dB.

Thresh is expressed in the same unit as *Mn*.

5.5.4.8 Event B2 (Serving becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2)

The UE shall:

> 1> for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;

> 1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;

> 1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$Ms + Hys < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$Mn + Ofn - Hys > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$Ms - Hys > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$Mn + Ofn + Hys < Thresh2$$

The variables in the formula are defined as follows:

> *Ms* is the measurement result of the serving cell, not taking into account any offsets.

> *Mn* is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, *pilotStrength* is divided by -2.

> *Ofn* is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the inter-RAT neighbour cell).

> *Hys* is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

> *Thresh1* is the threshold parameter for this event (i.e. b2-*Threshold1* as defined within *reportConfigInterRAT* for this event).

> *Thresh2* is the threshold parameter for this event (i.e. *b2-Threshold2* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b2-Threshold2* is divided by -2.

> *Ms* is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

> *Mn* is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.

> *Ofn, Hys* are expressed in dB.

> *Thresh1* is expressed in the same unit as *Ms*.

> *Thresh2* is expressed in the same unit as *Mn*.

5.5.5 Measurement reporting
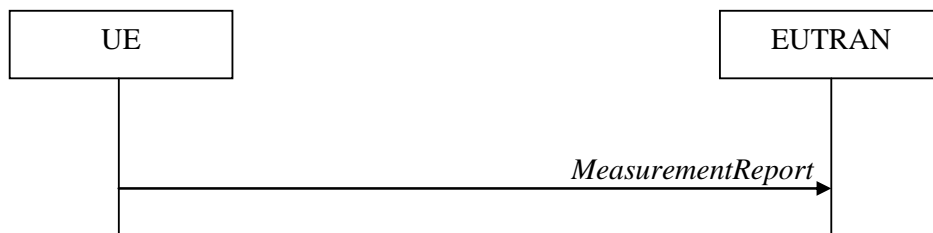
Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServCell* to include the quantities of serving cell;

1> if there is at least one applicable neighbouring cell to report:

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *triggerType* is set to '*event*':

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

3> else:

4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *triggerType* is set to '*event*'; or the *purpose* is set to '*reportStrongestCells*' or to '*reportStrongestCellsForSON*':

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns E-UTRA:

6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfig* in order of decreasing *triggerQuantity*, i.e. the best cell is included first;

5> else:

6> set the *measResult* to the quantity as configured for the concerned RAT within the *quantityConfig* in order of either decreasing quantity for UTRA and GERAN or increasing quantity for CDMA2000 *pilotStrength*, i.e. the best cell is included first;

3> else if the *purpose* is set to '*reportCGI*':

4> if the mandatory present fields of the *cgi-Info* for the cell indicated by the *cellForWhichToReportCGI* in the associated *measObject* have been obtained:

      5> include the *cgi-Info* containing all the fields that have been successfully acquired;

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

    2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

    2> if the *triggerType* is set to '*periodical*':

        3> remove the entry within the *VarMeasReportList* for this *measId*;

        3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the measured results are for CDMA2000 HRPD:

    2> set the *preRegistrationStatusHRPD* to the UE's CDMA2000 upper layer's HRPD *preRegistrationStatus*;

1> if the measured results are for CDMA2000 1xRTT:

    2> set the *preRegistrationStatusHRPD* to '*FALSE*';

1> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends;

5.5.6 Measurement related actions

5.5.6.1 Actions upon handover and re-establishment

E-UTRAN applies the handover procedure as follows:

- when performing the handover procedure, as specified in 5.3.5.4, ensure that a *measObjectId* corresponding to the handover target carrier frequency is configured as a result of the procedures described in this sub-clause and in 5.3.5.4;

E-UTRAN applies the re-establishment procedure as follows:

- when performing the connection re-establishment procedure, as specified in 5.3.7, ensure that a *measObjectId* corresponding to the target carrier frequency is configured as a result of the procedure described in this sub-clause and the subsequent connection reconfiguration procedure immediately following the re-establishment procedure;

The UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

    2> if the *triggerType* is set to '*periodical*':

        3> remove this *measId* from the *measIdList* within *VarMeasConfig*:

1> if the procedure was triggered due to inter-frequency handover or successful re-establishment to an inter-frequency cell, update the *measId* values in the *measIdList* within *VarMeasConfig* as follows:

    2> if a *measObjectId* value corresponding to the target carrier frequency exists in the *measObjectList* within *VarMeasConfig*:

        3> for each *measId* value in the *measIdList*:

            4> if the *measId* value is linked to the *measObjectId* value corresponding to the source carrier frequency:

                5> link this *measId* value to the *measObjectId* value corresponding to the target carrier frequency;

4> else if the *measId* value is linked to the *measObjectId* value corresponding to the target carrier frequency:

5> link this *measId* value to the *measObjectId* value corresponding to the source carrier frequency;

2> else:

3> remove all *measId* values that are linked to the *measObjectId* value corresponding to the source carrier frequency;

1> remove all measurement reporting entries within *VarMeasReportList*;

1> reset the periodical reporting timer or timer T321, whichever one is running, as well as associated information (e.g. *timeToTrigger*) for all *measId*;

1> release the measurement gaps, if activated;

NOTE: If the UE requires measurement gaps to perform inter-frequency or inter-RAT measurements, the UE resumes the inter-frequency and inter-RAT measurements after the E-UTRAN has setup the measurement gaps.

5.5.6.2 Speed dependant scaling of measurement related parameters

The UE shall adjust the value of the following parameter configured by the E-UTRAN depending on the UE speed: *timeToTrigger*. The UE shall apply 3 different levels, which are selected as follows:

The UE shall:

1> perform mobility state detection using the mobility state detection as specified in TS 36.304 [4] with the following modifications:

2> counting handovers instead of cell reselections;

2> applying the parameter applicable for RRC_CONNECTED as included in *speedStatePars* within *VarMeasConfig*;

1> if high mobility state is detected:

2> use the *timeToTrigger* value multiplied by *sf-High* within *VarMeasConfig*;

1> else if medium mobility state is detected:

2> use the *timeToTrigger* value multiplied by *sf-Medium* within *VarMeasConfig*;

1> else

2> no scaling is applied;

5.6 Other

5.6.1 DL information transfer

5.6.1.1 General
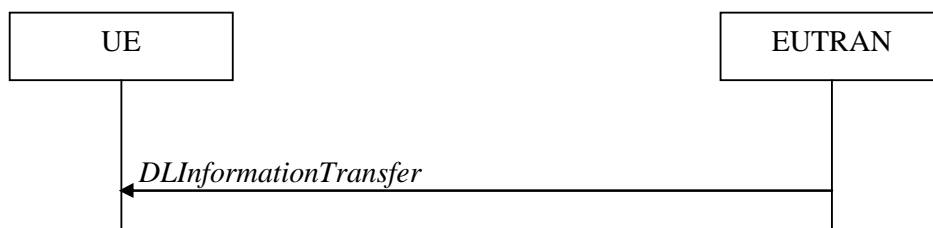
Figure 5.6.1.1-1: DL information transfer

The purpose of this procedure is to transfer NAS or (tunnelled) non-3GPP dedicated information from E-UTRAN to a UE in RRC_CONNECTED.

5.6.1.2 Initiation

E-UTRAN initiates the DL information transfer procedure whenever there is a need to transfer NAS or non-3GPP dedicated information. E-UTRAN initiates the DL information transfer procedure by sending the *DLInformationTransfer* message.

5.6.1.3 Reception of the *DLInformationTransfer* by the UE

Upon receiving *DLInformationTransfer* message, the UE shall:

> 1> if the *dedicatedInfoType* is set to '*dedicatedInfoNAS*':

>> 2> forward the *dedicatedInfoNAS* to the NAS upper layers.

> 1> if the *dedicatedInfoType* is set to '*dedicatedInfoCDMA2000-1XRTT*' or to '*dedicatedInfoCDMA2000-HRPD*':

>> 2> forward the *dedicatedInfoCDMA2000* to the CDMA2000 upper layers;

5.6.2 UL information transfer

5.6.2.1 General

Figure 5.6.2.1-1: UL information transfer

The purpose of this procedure is to transfer NAS or (tunnelled) non-3GPP dedicated information from the UE to E-UTRAN.

5.6.2.2 Initiation

A UE in RRC_CONNECTED initiates the UL information transfer procedure whenever there is a need to transfer NAS or non-3GPP dedicated information, except at RRC connection establishment in which case the NAS information is piggybacked to the *RRCConnectionSetupComplete* message. The UE initiates the UL information transfer procedure by sending the *ULInformationTransfer* message. When CDMA2000 information has to be transferred, the UE shall initiate the procedure only if SRB2 is established.

5.6.2.3 Actions related to transmission of *ULInformationTransfer* message

The UE shall set the contents of the *ULInformationTransfer* message as follows:

> 1> if there is a need to transfer NAS information:

>> 2> set the *dedicatedInfoType* to include the '*dedicatedInfoNAS*';

> 1> if there is a need to transfer CDMA2000 1XRTT information:

>> 2> set the *dedicatedInfoType* to include the '*dedicatedInfoCDMA2000-1XRTT*';

> 1> if there is a need to transfer CDMA2000 HRPD information:

>> 2> set the *dedicatedInfoType* to include the '*dedicatedInfoCDMA2000-HRPD*';

1> submit the *ULInformationTransfer* message to lower layers for transmission, upon which the procedure ends;

5.6.2.4   Failure to deliver *ULInformationTransfer* message

The UE shall:

1> if mobility (i.e. handover, RRC connection re-establishment) occurs before the successful delivery of *ULInformationTransfer* messages has been confirmed by lower layers:

2> inform upper layers about the possible failure to deliver the information contained in the concerned *ULInformationTransfer* messages;

5.6.3 UE capability transfer

5.6.3.1 General
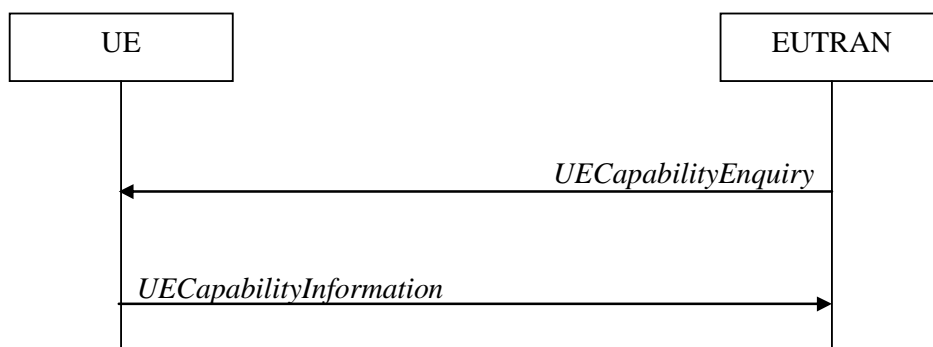
Figure 5.6.3.1-1: UE capability transfer

The purpose of this procedure is to transfer UE radio access capability information from the UE to E-UTRAN.

If the UE has changed its E-UTRAN radio access capabilities, the UE shall request higher layers to initiate the necessary NAS procedures (see TS 23.401) that would result in the update of UE radio access capabilities using a new RRC connection.

NOTE: Change of the UE's GERAN and/ or UTRAN UE radio capabilities in RRC_IDLE is supported by use of Tracking Area Update.

5.6.3.2 Initiation

E-UTRAN initiates the procedure to a UE in RRC_CONNECTED when it needs (additional) UE radio access capability information.

5.6.3.3 Reception of the *UECapabilityEnquiry* by the UE

The UE shall:

1> set the contents of *UECapabilityInformation* message as follows:

2> if the *ue-CapabilityRequest* includes '*eutra*':

3> include the *UE-EUTRA-Capability* within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to '*eutra*';

2> if the *ue-CapabilityRequest* includes '*geran-cs*' and if the UE supports GERAN CS domain:

3> include the UE radio access capabilities for GERAN CS within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to '*geran-cs*';

2> if the *ue-CapabilityRequest* includes '*geran-ps*' and if the UE supports GERAN PS domain:

> 3> include the UE radio access capabilities for GERAN PS within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to '*geran-ps*';

> 2> if the *ue-CapabilityRequest* includes '*utra*' and if the UE supports UTRA:

> 3> include the UE radio access capabilities for UTRA within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to '*utra*';

> 2> if the *ue-CapabilityRequest* includes '*cdma2000-1XRTT*' and if the UE supports CDMA2000 1xRTT:

> 3> include the UE radio access capabilities for CDMA2000 within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to '*cdma2000-1XRTT*';

> 1> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends;

5.6.4 CSFB to 1x Parameter transfer

5.6.4.1 General
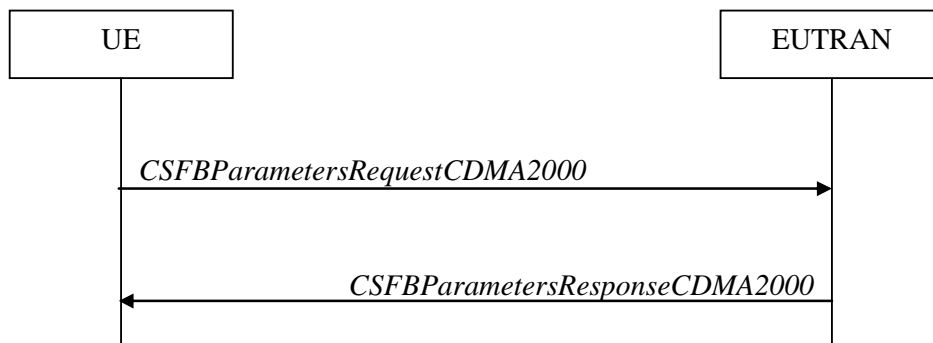
Figure 5.6.4.1-1: CSFB to 1x Parameter transfer

The purpose of this procedure is to transfer the CDMA2000 1xRTT parameters required to register the UE in the CDMA2000 1xRTT network for CSFB support.

5.6.4.2 Initiation

A UE in RRC_CONNECTED initiates the CSFB to 1x Parameter transfer procedure upon request from the CDMA2000 upper layers. The UE initiates the CSFB to 1x Parameter transfer procedure by sending the *CSFBParametersRequestCDMA2000* message.

5.6.4.3 Actions related to transmission of *CSFBParametersRequestCDMA2000* message

The UE shall:

> 1> submit the *CSFBParametersRequestCDMA2000* message to lower layers for transmission using the current configuration;

5.6.4.4 Reception of the *CSFBParametersResponseCDMA2000* message

Upon reception of the *CSFBParametersResponseCDMA2000* message, the UE shall:

> 1> forward the *rand* and the *mobilityParameters* to the CDMA2000 1xRTT upper layers;

5.7　Generic error handling

5.7.1　General

The generic error handling defined in the subsequent sub-clauses applies unless explicitly specified otherwise e.g. within the procedure specific error handling.

The UE shall consider a value as not comprehended when it is set:

- to an extended value that is not defined in the version of the transfer syntax supported by the UE.

- to a spare or reserved value unless the specification defines specific behaviour that the UE shall apply upon receiving the concerned spare/ reserved value.

The UE shall consider a field as not comprehended when it is defined:

- as spare or reserved unless the specification defines specific behaviour that the UE shall apply upon receiving the concerned spare/ reserved field.

5.7.2　ASN.1 violation or encoding error

The UE shall:

1> when receiving an RRC message on the BCCH, PCCH or CCCH for which the abstract syntax is invalid [13]:

2> ignore the message;

NOTE　This section applies in case one or more fields is set to a value, other than a spare, reserved or extended value, not defined in this version of the transfer syntax. E.g. in the case the UE receives value 12 for a field defined as INTEGER (1..11). In cases like this, it may not be possible to reliably detect which field is in the error hence the error handling is at the message level.

5.7.3　Field set to a not comprehended value

The UE shall, when receiving an RRC message on any logical channel:

1> if the message includes a field that has a value that the UE does not comprehend:

2> if a default value is defined for this field:

3> treat the message while using the default value defined for this field;

2> else if the concerned field is optional:

3> treat the message as if the field were absent and in accordance with the need code for absence of the concerned field;

2> else:

3> treat the message as if the field were absent and in accordance with sub-clause 5.7.4;

5.7.4　Mandatory field missing

The UE shall:

1> if the message includes a field that is mandatory to include in the message (e.g. because conditions for mandatory presence are fulfilled) and that field is absent or treated as absent:

2> if the RRC message was received on DCCH or CCCH:

3> ignore the message;

2> else:

   3> if the field concerns a (sub-field of) an entry of a list (i.e. a SEQUENCE OF):

      4> treat the list as if the entry including the missing or not comprehended field was not present;

   3> else if the field concerns a sub-field of another field, referred to as the 'parent' field i.e. the field that is one
      nesting level up compared to the erroneous field:

      4> consider the 'parent' field to be set to a not comprehended value;

      4> apply the generic error handling to the subsequent 'parent' field(s), until reaching the top nesting level
         i.e. the message level;

   3> else (field at message level):

      4> ignore the message;

NOTE: The error handling defined in these sub-clauses implies that the UE ignores a message with the message
         type or version set to a not comprehended value.

5.7.5   Not comprehended field

The UE shall, when receiving an RRC message on any logical channel:

   1> if the message includes a field that the UE does not comprehend:

      2> treat the rest of the message as if the field was absent;

NOTE: This section does not apply to the case of an extension to the value range of a field. Such cases are
         addressed instead by the requirements in section 5.7.3.

6   Protocol data units, formats and parameters (tabular & ASN.1)

6.1   General

The contents of each RRC message is specified in sub-clause 6.2 using ASN.1 to specify the message syntax and using
tables when needed to provide further detailed information about the information elements specified in the message
syntax. The syntax of the information elements that are defined as stand-alone abstract types is further specified in a
similar manner in sub-clause 6.3.

The need for information elements to be present in a message or an abstract type, i.e., the ASN.1 fields that are
specified as OPTIONAL in the abstract notation (ASN.1), is specified by means of comment text tags attached to the
OPTIONAL statement in the abstract syntax. All comment text tags are available for use in the downlink direction only.
The meaning of each tag is specified in table 6.1-1.

Table 6.1-1: Meaning of abbreviations used to specify the need for information elements to be present

Abbreviation	Meaning
Cond *conditionTag* (Used in downlink only)	*Conditionally present* An information element for which the need is specified by means of conditions. For each *conditionTag*, the need is specified in a tabular form following the ASN.1 segment. In case, according to the conditions, a field is not present, the UE takes no action and where applicable shall continue to use the existing value (and/ or the associated functionality) unless explicitly stated otherwise in the description of the field itself.
Need OP (Used in downlink only)	*Optionally present* An information element that is optional to signal. For downlink messages, the UE is not required to take any special action on absence of the IE beyond what is specified in the procedural text or the field description table following the ASN.1 segment. The UE behaviour on absence should be captured either in the procedural text or in the field description.
Need ON	*Optionally present, No action*

Abbreviation	Meaning
(Used in downlink only)	An information element that is optional to signal. If the message is received by the UE, and in case the information element is absent, the UE takes no action and where applicable shall continue to use the existing value (and/ or the associated functionality).
Need OR (Used in downlink only)	*Optionally present, Release* An information element that is optional to signal. If the message is received by the UE, and in case the information element is absent, the UE shall discontinue/ stop using/ delete any existing value (and/ or the associated functionality).

Any IE with Need ON in system information shall be interpreted as Need OR.

6.2 RRC messages

NOTE: The messages included in this section reflect the current status of the discussions. Additional messages may be included at a later stage.

6.2.1 General message structure

– *EUTRA-RRC-Definitions*

This ASN.1 segment is the start of the E-UTRA RRC PDU definitions.

```
-- ASN1START

EUTRA-RRC-Definitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- ASN1STOP
```

– *BCCH-BCH-Message*

The *BCCH-BCH-Message* class is the set of RRC messages that may be sent from the E-UTRAN to the UE via BCH on the BCCH logical channel.

```
-- ASN1START

BCCH-BCH-Message ::= SEQUENCE {
    message                 BCCH-BCH-MessageType
}

BCCH-BCH-MessageType ::=                     MasterInformationBlock

-- ASN1STOP
```

– *BCCH-DL-SCH-Message*

The *BCCH-DL-SCH-Message* class is the set of RRC messages that may be sent from the E-UTRAN to the UE via DL-SCH on the BCCH logical channel.

```
-- ASN1START

BCCH-DL-SCH-Message ::= SEQUENCE {
    message             BCCH-DL-SCH-MessageType
}

BCCH-DL-SCH-MessageType ::= CHOICE {
    c1                      CHOICE {
        systemInformation                       SystemInformation,
        systemInformationBlockType1             SystemInformationBlockType1
    },
    messageClassExtension   SEQUENCE {}
}
```

```
-- ASN1STOP
```

– *PCCH-Message*

The *PCCH-Message* class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the PCCH logical channel.

```
-- ASN1START

PCCH-Message ::= SEQUENCE {
    message                 PCCH-MessageType
}

PCCH-MessageType ::= CHOICE {
    c1                      CHOICE {
        paging                                      Paging
    },
    messageClassExtension   SEQUENCE {}
}

-- ASN1STOP
```

– *DL-CCCH-Message*

The *DL-CCCH-Message* class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink CCCH logical channel.

```
-- ASN1START

DL-CCCH-Message ::= SEQUENCE {
    message                 DL-CCCH-MessageType
}

DL-CCCH-MessageType ::= CHOICE {
    c1                      CHOICE {
        rrcConnectionReestablishment            RRCConnectionReestablishment,
        rrcConnectionReestablishmentReject      RRCConnectionReestablishmentReject,
        rrcConnectionReject                     RRCConnectionReject,
        rrcConnectionSetup                      RRCConnectionSetup
    },
    messageClassExtension   SEQUENCE {}
}

-- ASN1STOP
```

– *DL-DCCH-Message*

The *DL-DCCH-Message* class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink DCCH logical channel.

```
-- ASN1START

DL-DCCH-Message ::= SEQUENCE {
    message                 DL-DCCH-MessageType
}

DL-DCCH-MessageType ::= CHOICE {
    c1                      CHOICE {
        csfbParametersResponseCDMA2000          CSFBParametersResponseCDMA2000,
        dlInformationTransfer                   DLInformationTransfer,
        handoverFromEUTRAPreparationRequest     HandoverFromEUTRAPreparationRequest,
        mobilityFromEUTRACommand                MobilityFromEUTRACommand,
        rrcConnectionReconfiguration            RRCConnectionReconfiguration,
        rrcConnectionRelease                    RRCConnectionRelease,
        securityModeCommand                     SecurityModeCommand,
        ueCapabilityEnquiry                     UECapabilityEnquiry,
        counterCheck                            CounterCheck,
        spare7 NULL,
        spare6 NULL, spare5 NULL, spare4 NULL,
```

```
        spare3 NULL, spare2 NULL, spare1 NULL
    },
    messageClassExtension    SEQUENCE {}
}

-- ASN1STOP
```

– UL-CCCH-Message

The *UL-CCCH-Message* class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink
CCCH logical channel.

```
-- ASN1START

UL-CCCH-Message ::= SEQUENCE {
    message                 UL-CCCH-MessageType
}

UL-CCCH-MessageType ::= CHOICE {
    c1                          CHOICE {
        rrcConnectionReestablishmentRequest     RRCConnectionReestablishmentRequest,
        rrcConnectionRequest                    RRCConnectionRequest
    },
    messageClassExtension    SEQUENCE {}
}

-- ASN1STOP
```

– UL-DCCH-Message

The *UL-DCCH-Message* class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink
DCCH logical channel.

```
-- ASN1START

UL-DCCH-Message ::= SEQUENCE {
    message                 UL-DCCH-MessageType
}

UL-DCCH-MessageType ::= CHOICE {
    c1                          CHOICE {
        csfbParametersRequestCDMA2000           CSFBParametersRequestCDMA2000,
        measurementReport                       MeasurementReport,
        rrcConnectionReconfigurationComplete    RRCConnectionReconfigurationComplete,
        rrcConnectionReestablishmentComplete    RRCConnectionReestablishmentComplete,
        rrcConnectionSetupComplete              RRCConnectionSetupComplete,
        securityModeComplete                    SecurityModeComplete,
        securityModeFailure                     SecurityModeFailure,
        ueCapabilityInformation                 UECapabilityInformation,
        ulHandoverPreparationTransfer           ULHandoverPreparationTransfer,
        ulInformationTransfer                   ULInformationTransfer,
        counterCheckResponse                    CounterCheckResponse,
        spare5 NULL, spare4 NULL,
        spare3 NULL, spare2 NULL, spare1 NULL
    },
    messageClassExtension    SEQUENCE {}
}

-- ASN1STOP
```

6.2.2 Message definitions

– *CounterCheck*

The *CounterCheck* message is used by the E-UTRAN to indicate the current COUNT MSB values associated to each DRB and to request the UE to compare these to its COUNT MSB values and to report the comparison results to E-UTRAN.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

CounterCheck message

```
-- ASN1START

CounterCheck ::=             SEQUENCE {
    rrc-TransactionIdentifier        RRC-TransactionIdentifier,
    criticalExtensions               CHOICE {
        c1                               CHOICE {
            counterCheck-r8                  CounterCheck-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture         SEQUENCE {}
    }
}

CounterCheck-r8-IEs ::= SEQUENCE {
    drb-CountMSB-InfoList             DRB-CountMSB-InfoList,
    nonCriticalExtension             SEQUENCE {}                         OPTIONAL    --Need OP
}

DRB-CountMSB-InfoList::=         SEQUENCE (SIZE (1..maxDRB)) OF DRB-CountMSB-Info

DRB-CountMSB-Info ::=    SEQUENCE {
    drb-Identity                DRB-Identity,
    countMSB-Uplink             INTEGER(0..33554431),
    countMSB-Downlink           INTEGER(0..33554431)
}

-- ASN1STOP
```

CounterCheck field descriptions
drb-CountMSB-InfoList
Indicates the MSBs of the COUNT values of the DRBs.
count-MSB-Uplink
Indicates the value of 25 MSBs from uplink COUNT associated to this DRB.
count-MSB-Downlink
Indicates the value of 25 MSBs from downlink COUNT associated to this DRB.

– *CounterCheckResponse*

The *CounterCheckResponse* message is used by the UE to respond to a *CounterCheck* message.

> Signalling radio bearer: SRB1

> RLC-SAP: AM

> Logical channel: DCCH

> Direction: UE to E-UTRAN

<div align="center">

***CounterCheckResponse* message**

</div>

```
-- ASN1START

CounterCheckResponse ::=             SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        counterCheckResponse-r8             CounterCheckResponse-r8-IEs,
        criticalExtensionsFuture            SEQUENCE {}
    }
}

CounterCheckResponse-r8-IEs ::= SEQUENCE {
    drb-CountInfoList                   DRB-CountInfoList,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

DRB-CountInfoList ::=           SEQUENCE (SIZE (0..maxDRB)) OF DRB-CountInfo

DRB-CountInfo ::=    SEQUENCE {
    drb-Identity                    DRB-Identity,
    count-Uplink                    INTEGER(0..4294967295),
    count-Downlink                  INTEGER(0..4294967295)
}

-- ASN1STOP
```

***CounterCheckResponse* field descriptions**
drb-CountInfoList
Indicates the COUNT values of the DRBs.
count-Uplink
Indicates the value of uplink COUNT associated to this DRB.
count-Downlink
Indicates the value of downlink COUNT associated to this DRB.

– *CSFBParametersRequestCDMA2000*

The *CSFBParametersRequestCDMA2000* message is used by the UE to obtain the CDMA2000 1xRTT Parameters from the network. The UE needs these parameters to generate the CDMA2000 1xRTT Registration message used to register with the CDMA2000 1xRTT Network which is required to support CSFB to CDMA2000 1xRTT.

> Signalling radio bearer: SRB1

> RLC-SAP: AM

> Logical channel: DCCH

> Direction: UE to E-UTRAN

<div align="center">

***CSFBParametersRequestCDMA2000* message**

</div>

```
-- ASN1START

CSFBParametersRequestCDMA2000 ::= SEQUENCE {
    criticalExtensions                  CHOICE {
        csfbParametersRequestCDMA2000-r8    CSFBParametersRequestCDMA2000-r8-IEs,
        criticalExtensionsFuture            SEQUENCE {}
```

```
    }
}

CSFBParametersRequestCDMA2000-r8-IEs ::= SEQUENCE {
    nonCriticalExtension                SEQUENCE {}                             OPTIONAL
}
-- ASN1STOP
```

– *CSFBParametersResponseCDMA2000*

The *CSFBParametersResponseCDMA2000* message is used to provide the CDMA2000 1xRTT Parameters to the UE so the UE can register with the CDMA2000 1xRTT Network to support CSFB to CDMA2000 1xRTT.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

CSFBParametersResponseCDMA2000 **message**

```
-- ASN1START

CSFBParametersResponseCDMA2000 ::= SEQUENCE {
    rrc-TransactionIdentifier          RRC-TransactionIdentifier,
    criticalExtensions                 CHOICE {
        csfbParametersResponseCDMA2000-r8    CSFBParametersResponseCDMA2000-r8-IEs,
        criticalExtensionsFuture             SEQUENCE {}
    }
}

CSFBParametersResponseCDMA2000-r8-IEs ::= SEQUENCE {
    rand                               RAND-CDMA2000,
    mobilityParameters                 MobilityParametersCDMA2000,
    nonCriticalExtension               SEQUENCE {}                    OPTIONAL    --Need OP
}

-- ASN1STOP
```

– *DLInformationTransfer*

The *DLInformationTransfer* message is used for the downlink transfer of dedicated NAS information.

Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet. If SRB2 is suspended, E-UTRAN does not send this message until SRB2 is resumed.)

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

DLInformationTransfer **message**

```
-- ASN1START

DLInformationTransfer ::=            SEQUENCE {
    rrc-TransactionIdentifier          RRC-TransactionIdentifier,
    criticalExtensions                 CHOICE {
        c1                                 CHOICE {
            dlInformationTransfer-r8             DLInformationTransfer-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture           SEQUENCE {}
    }
}
```

```
DLInformationTransfer-r8-IEs ::=    SEQUENCE {
    dedicatedInfoType                   CHOICE {
        dedicatedInfoNAS                    DedicatedInfoNAS,
        dedicatedInfoCDMA2000-1XRTT         DedicatedInfoCDMA2000,
        dedicatedInfoCDMA2000-HRPD          DedicatedInfoCDMA2000
    },
    nonCriticalExtension                SEQUENCE {}                 OPTIONAL    --Need OP
}

-- ASN1STOP
```

– *HandoverFromEUTRAPreparationRequest* (CDMA2000)

The *HandoverFromEUTRAPreparationRequest* message is used to trigger the handover preparation procedure with a CDMA2000 RAT.

> Signalling radio bearer: SRB1
>
> RLC-SAP: AM
>
> Logical channel: DCCH
>
> Direction: E-UTRAN to UE

HandoverFromEUTRAPreparationRequest message

```
-- ASN1START

HandoverFromEUTRAPreparationRequest ::= SEQUENCE {
    rrc-TransactionIdentifier       RRC-TransactionIdentifier,
    criticalExtensions              CHOICE {
        c1                                  CHOICE {
            handoverFromEUTRAPreparationRequest-r8
                                            HandoverFromEUTRAPreparationRequest-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

HandoverFromEUTRAPreparationRequest-r8-IEs ::= SEQUENCE {
    cdma2000-Type                   CDMA2000-Type,
    rand                            RAND-CDMA2000           OPTIONAL,  -- Cond cdma2000-Type
    mobilityParameters              MobilityParametersCDMA2000 OPTIONAL,  -- Cond cdma2000-Type
    nonCriticalExtension            SEQUENCE {}             OPTIONAL   -- Need OP
}

-- ASN1STOP
```

Conditional presence	Explanation
cdma2000-Type	The field is mandatory present if the *cdma2000-Type* = *type1XRTT*; otherwise it is not present.

– *MasterInformationBlock*

The *MasterInformationBlock* includes the system information transmitted on BCH.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E-UTRAN to UE

MasterInformationBlock

```
-- ASN1START

MasterInformationBlock ::=          SEQUENCE {
    dl-Bandwidth                        ENUMERATED {
                                            n6, n15, n25, n50, n75, n100},
    phich-Config                        PHICH-Config,
    systemFrameNumber                   BIT STRING (SIZE (8)),
    spare                               BIT STRING (SIZE (10))
}


-- ASN1STOP
```

MasterInformationBlock field descriptions
dl-Bandwidth
Parameter: transmission bandwidth configuration, N_{RB} in downlink, see TS 36.101 [42, table 5.6-1]. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.
systemFrameNumber
Defines the 8 most significant bits of the SFN, see TS 36.211 [21, 6.6.1]. The 2 least significant bits of the SFN are acquired implicitly in the P-BCH decoding, i.e. timing of 40ms P-BCH TTI indicates 2 least significant bits (within 40ms P-BCH TTI, the first radio frame: 00, the second radio frame: 01, the third radio frame: 10, the last radio frame: 11).

– *MeasurementReport*

The *MeasurementReport* message is used for the indication of measurement results.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

MeasurementReport message

```
-- ASN1START

MeasurementReport ::=               SEQUENCE {
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            measurementReport-r8                MeasurementReport-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

MeasurementReport-r8-IEs ::=        SEQUENCE {
    measResults                         MeasResults,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}
-- ASN1STOP
```

– *MobilityFromEUTRACommand*

The *MobilityFromEUTRACommand* message is used to command handover or a cell change from E-UTRA to another RAT (3GPP or non-3GPP).

> Signalling radio bearer: SRB1

> RLC-SAP: AM

> Logical channel: DCCH

> Direction: E-UTRAN to UE

MobilityFromEUTRACommand **message**

```
-- ASN1START

MobilityFromEUTRACommand ::=        SEQUENCE {
    rrc-TransactionIdentifier          RRC-TransactionIdentifier,
    criticalExtensions                 CHOICE {
        c1                                 CHOICE{
            mobilityFromEUTRACommand-r8        MobilityFromEUTRACommand-r8-IEs,
            spare3 NULL, spare2 NULL, spare1   NULL
        },
        criticalExtensionsFuture           SEQUENCE {}
    }
}

MobilityFromEUTRACommand-r8-IEs ::= SEQUENCE {
    cs-FallbackIndicator               BOOLEAN,
    purpose                            CHOICE{
        handover                           Handover,
        cellChangeOrder                    CellChangeOrder
    },
    nonCriticalExtension               MobilityFromEUTRACommand-v8a0-IEs   OPTIONAL
}

MobilityFromEUTRACommand-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension           OCTET STRING                        OPTIONAL,   -- Need OP
    nonCriticalExtension               MobilityFromEUTRACommand-v8d0-IEs   OPTIONAL
}

MobilityFromEUTRACommand-v8d0-IEs ::= SEQUENCE {
    bandIndicator                      BandIndicatorGERAN        OPTIONAL,   -- Cond GERAN
    nonCriticalExtension               SEQUENCE {}               OPTIONAL    -- Need OP
}

Handover ::=                       SEQUENCE {
    targetRAT-Type                     ENUMERATED {
                                           utra, geran, cdma2000-1XRTT, cdma2000-HRPD,
                                           spare4, spare3, spare2, spare1, ...},
    targetRAT-MessageContainer         OCTET STRING,
    nas-SecurityParamFromEUTRA         OCTET STRING (SIZE (1))   OPTIONAL,   -- Cond UTRAGERAN
    systemInformation                  SI-OrPSI-GERAN            OPTIONAL    -- Cond PSHO
}

CellChangeOrder ::=                SEQUENCE {
    t304                               ENUMERATED {
                                           ms100, ms200, ms500, ms1000,
                                           ms2000, ms4000, ms8000, spare1},
    targetRAT-Type                     CHOICE {
        geran                              SEQUENCE {
            physCellId                         PhysCellIdGERAN,
            carrierFreq                        CarrierFreqGERAN,
            networkControlOrder                BIT STRING (SIZE (2))     OPTIONAL,   -- Need OP
            systemInformation                  SI-OrPSI-GERAN            OPTIONAL    -- Need OP
        },
        ...
    }
}

SI-OrPSI-GERAN ::=                 CHOICE {
    si                                 SystemInfoListGERAN,
    psi                                SystemInfoListGERAN
}
```

```
SystemInfoListGERAN ::=                    SEQUENCE (SIZE (1..maxGERAN-SI)) OF
                                              OCTET STRING (SIZE (1..23))

-- ASN1STOP
```

MobilityFromEUTRACommand field descriptions
t304
Timer T304 as described in section 7.3. Value ms100 corresponds with 100 ms, ms200 corresponds with 200 ms and so on.
cs-FallbackIndicator
Indicates whether or not the CS Fallback procedure is triggered. E-UTRAN only applies value 'false' when targetRAT-Type is set to 'cdma2000-1XRTT' or to 'cdma2000-HRPD'.
bandIndicator
Indicates how to interpret the ARFCN of the BCCH carrier.
targetRAT-Type
Indicates the target RAT type.
targetRAT-MessageContainer
The field contains a message specified in another standard, as indicated by the targetRAT-Type, and carries information about the target cell identifier(s) and radio parameters relevant for the target radio access technology. NOTE 1.
A complete message is included, as specified in the other standard.
nas-SecurityParamFromEUTRA
Used to deliver the key synchronisation and Key freshness for the E-UTRAN to UTRAN handovers as specified in TS 33.401. The content of the parameter is defined in TS24.301.
carrierFreq
contains the carrier frequency of the target GERAN cell.
networkControlOrder
Parameter NETWORK_CONTROL_ORDER in TS 44.060 [36].
SystemInfoListGERAN
Each OCTET STRING contains one System Information (SI) message as defined in TS 44.018 [45, table 9.1.1] excluding the L2 Pseudo Length, the RR management Protocol Discriminator and the Skip Indicator or a complete Packet System Information (PSI) message as defined in TS 44.060 [36, table 11.2.1]. If purpose = 'CellChangeOrder' and if the field is not present, the UE has to acquire this from the GERAN cell.

Conditional presence	Explanation
UTRAGERAN	The field is mandatory present if the targetRAT-Type is set to "utra" or "geran"; otherwise the field is not present
GERAN	The field should be present if the purpose is set to "handover" and the targetRAT-Type is set to "geran"; otherwise the field is not present
PSHO	The field is mandatory present in case of PS handover toward GERAN; otherwise the field is optionally present, but not used by the UE

NOTE 1: The correspondence between the value of the targetRAT-Type, the standard to apply and the message contained within the targetRAT-MessageContainer is shown in the table below:

targetRAT-Type	Standard to apply	targetRAT-MessageContainer
geran	GSM TS 04.18, version 8.5.0 or later, or 3GPP TS 44.018 (clause 9.1.15)	HANDOVER COMMAND
	3GPP TS 44.060, version 6.13.0 or later (clause 11.2.43)	PS HANDOVER COMMAND
	3GPP TS 44.060, version 7.6.0 or later (clause 11.2.46)	DTM HANDOVER COMMAND
cdma2000-1XRTT	C.S0001 or later, C.S0007 or later, C.S0008 or later	
cdma2000-HRPD	C.S0024 or later	
utra	3GPP TS 25.331 (clause 10.2.16a)	HANDOVER TO UTRAN COMMAND

– *Paging*

The *Paging* message is used for the notification of one or more UEs.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: PCCH

Direction: E-UTRAN to UE

Paging message

```
-- ASN1START

Paging ::=                    SEQUENCE {
    pagingRecordList                    PagingRecordList                        OPTIONAL,   -- Need ON
    systemInfoModification              ENUMERATED {true}                       OPTIONAL,   -- Need ON
    etws-Indication                     ENUMERATED {true}                       OPTIONAL,   -- Need ON
    nonCriticalExtension                SEQUENCE {}                             OPTIONAL    -- Need OP
}

PagingRecordList ::=          SEQUENCE (SIZE (1..maxPageRec)) OF PagingRecord

PagingRecord ::=              SEQUENCE {
    ue-Identity                 PagingUE-Identity,
    cn-Domain                   ENUMERATED  {ps, cs},
    ...
}

PagingUE-Identity ::=         CHOICE {
    s-TMSI                        S-TMSI,
    imsi                          IMSI,
    ...
}

IMSI ::=                      SEQUENCE (SIZE (6..21)) OF IMSI-Digit

IMSI-Digit::=                 INTEGER (0..9)

-- ASN1STOP
```

Paging field descriptions
cn-Domain
Indicates the origin of paging.
ue-Identity
Provides the NAS identity of the UE that is being paged.
systemInfoModification
If present: indication of a BCCH modification other than SIB10 and SIB11.
etws-Indication
If present: indication of an ETWS primary notification and/ or ETWS secondary notification.
imsi
The International Mobile Subscriber Identity, a globally unique permanent subscriber identity, see TS 23.003 [27]. The first element contains the first IMSI digit, the second element contains the second IMSI digit and so on.

– _RRCConnectionReconfiguration_

The _RRCConnectionReconfiguration_ message is the command to modify an RRC connection. It may convey information for measurement configuration, mobility control, radio resource configuration (including RBs, MAC main configuration and physical channel configuration) including any associated dedicated NAS information and security configuration.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

<center>*RRCConnectionReconfiguration* **message**</center>

```
-- ASN1START

RRCConnectionReconfiguration ::=     SEQUENCE {
    rrc-TransactionIdentifier         RRC-TransactionIdentifier,
    criticalExtensions                CHOICE {
        c1                                CHOICE{
            rrcConnectionReconfiguration-r8    RRCConnectionReconfiguration-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture          SEQUENCE {}
    }
}

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
    measConfig                        MeasConfig                        OPTIONAL,   -- Need ON
    mobilityControlInfo               MobilityControlInfo               OPTIONAL,   -- Cond HO
    dedicatedInfoNASList              SEQUENCE (SIZE(1..maxDRB)) OF
                                          DedicatedInfoNAS              OPTIONAL,   -- Cond nonHO
    radioResourceConfigDedicated      RadioResourceConfigDedicated      OPTIONAL, -- Cond HO-toEUTRA
    securityConfigHO                  SecurityConfigHO                  OPTIONAL,   -- Cond HO
    nonCriticalExtension              SEQUENCE {}                       OPTIONAL    -- Need OP
}

SecurityConfigHO ::=                  SEQUENCE {
    handoverType                          CHOICE {
        intraLTE                              SEQUENCE {
            securityAlgorithmConfig               SecurityAlgorithmConfig    OPTIONAL,   -- Need OP
            keyChangeIndicator                    BOOLEAN,
            nextHopChainingCount                  NextHopChainingCount
        },
        interRAT                              SEQUENCE {
            securityAlgorithmConfig               SecurityAlgorithmConfig,
            nas-SecurityParamToEUTRA              OCTET STRING (SIZE(6))
        }
    },
    ...
}

-- ASN1STOP
```

RRCConnectionReconfiguration field descriptions
dedicatedInfoNASList
This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for each PDU in the list.
nas-securityParamToEUTRA
This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although it affects activation of AS- security after inter-RAT handover to E-UTRA. The content is defined in TS 24.301.
keyChangeIndicator
'true' is used only in an intra-cell handover when a K_{eNB} key is derived from a native K_{ASME} key taken into use through the successful NAS SMC, as described in TS 33.401 [32] for K_{eNB} re-keying. 'false' is used in an intra-LTE handover when the new K_{eNB} key is obtained from the current K_{eNB} key or from the NH as described in TS 33.401 [32].
nextHopChainingCount
Parameter NCC: See TS 33.401 [32]

Conditional presence	Explanation
HO	The field is mandatory present in case of handover within E-UTRA or to E-UTRA; otherwise the field is not present.
nonHO	The field is not present in case of handover within E-UTRA or to E-UTRA; otherwise it is optional present, need ON.
HO-toEUTRA	The field is mandatory present in case of handover to E-UTRA; otherwise the field is optionally present, need ON.

– *RRCConnectionReconfigurationComplete*

The *RRCConnectionReconfigurationComplete* message is used to confirm the successful completion of an RRC connection reconfiguration.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

RRCConnectionReconfigurationComplete message

```
-- ASN1START

RRCConnectionReconfigurationComplete ::= SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        rrcConnectionReconfigurationComplete-r8
                                        RRCConnectionReconfigurationComplete-r8-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCConnectionReconfigurationComplete-r8-IEs ::= SEQUENCE {
    nonCriticalExtension                SEQUENCE {}                        OPTIONAL
}

-- ASN1STOP
```

– *RRCConnectionReestablishment*

The *RRCConnectionReestablishment* message is used to resolve contention and to re-establish SRB1.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

RRCConnectionReestablishment message

```
-- ASN1START

RRCConnectionReestablishment ::=      SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            rrcConnectionReestablishment-r8     RRCConnectionReestablishment-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4     NULL,
            spare3 NULL, spare2 NULL, spare1     NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}
```

```
RRCConnectionReestablishment-r8-IEs ::= SEQUENCE {
    radioResourceConfigDedicated        RadioResourceConfigDedicated,
    nextHopChainingCount                NextHopChainingCount,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- ASN1STOP
```

– RRCConnectionReestablishmentComplete

The *RRCConnectionReestablishmentComplete* message is used to confirm the successful completion of an RRC connection reestablishment.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

RRCConnectionReestablishmentComplete message

```
-- ASN1START

RRCConnectionReestablishmentComplete ::= SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        rrcConnectionReestablishmentComplete-r8
                                        RRCConnectionReestablishmentComplete-r8-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCConnectionReestablishmentComplete-r8-IEs ::= SEQUENCE {
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

– RRCConnectionReestablishmentReject

The *RRCConnectionReestablishmentReject* message is used to indicate the rejection of an RRC connection reestablishment request.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

RRCConnectionReestablishmentReject message

```
-- ASN1START

RRCConnectionReestablishmentReject ::= SEQUENCE {
    criticalExtensions                  CHOICE {
        rrcConnectionReestablishmentReject-r8
                                        RRCConnectionReestablishmentReject-r8-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCConnectionReestablishmentReject-r8-IEs ::= SEQUENCE {
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}
```

```
-- ASN1STOP
```

– *RRCConnectionReestablishmentRequest*

The *RRCConnectionReestablishmentRequest* message is used to request the reestablishment of an RRC connection.

    Signalling radio bearer: SRB0

    RLC-SAP: TM

    Logical channel: CCCH

    Direction: UE to E-UTRAN

RRCConnectionReestablishmentRequest message

```
-- ASN1START

RRCConnectionReestablishmentRequest ::= SEQUENCE {
    criticalExtensions                  CHOICE {
        rrcConnectionReestablishmentRequest-r8
                                        RRCConnectionReestablishmentRequest-r8-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCConnectionReestablishmentRequest-r8-IEs ::= SEQUENCE {
    ue-Identity                     ReestabUE-Identity,
    reestablishmentCause            ReestablishmentCause,
    spare                           BIT STRING (SIZE (2))
}

ReestabUE-Identity ::=              SEQUENCE {
    c-RNTI                          C-RNTI,
    physCellId                      PhysCellId,
    shortMAC-I                      ShortMAC-I
}

ReestablishmentCause ::=            ENUMERATED {
                                    reconfigurationFailure, handoverFailure,
                                    otherFailure, spare1}

-- ASN1STOP
```

RRCConnectionReestablishmentRequest field descriptions
ue-Identity
UE identity included to retrieve UE context and to facilitate contention resolution by lower layers.
reestablishmentCause
Indicates the failure cause that triggered the re-establishment procedure.
physCellId
The Physical Cell Identity of the cell the UE was connected to prior to the failure.

– *RRCConnectionReject*

The *RRCConnectionReject* message is used to reject the RRC connection establishment.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

RRCConnectionReject message

```
-- ASN1START

RRCConnectionReject ::=               SEQUENCE {
    criticalExtensions                CHOICE {
        c1                                CHOICE {
            rrcConnectionReject-r8            RRCConnectionReject-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture          SEQUENCE {}
    }
}

RRCConnectionReject-r8-IEs ::=     SEQUENCE {
    waitTime                          INTEGER (1..16),
    nonCriticalExtension              SEQUENCE {}                      OPTIONAL    -- Need OP
}

-- ASN1STOP
```

RRCConnectionReject field descriptions
waitTime
Wait time value in seconds.

– *RRCConnectionRelease*

The *RRCConnectionRelease* message is used to command the release of an RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

RRCConnectionRelease message

```
-- ASN1START

RRCConnectionRelease ::=              SEQUENCE {
    rrc-TransactionIdentifier         RRC-TransactionIdentifier,
    criticalExtensions                CHOICE {
        c1                                CHOICE {
            rrcConnectionRelease-r8          RRCConnectionRelease-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture          SEQUENCE {}
    }
}

RRCConnectionRelease-r8-IEs ::=    SEQUENCE {
    releaseCause                      ReleaseCause,
    redirectedCarrierInfo             RedirectedCarrierInfo                 OPTIONAL,   -- Need ON
    idleModeMobilityControlInfo       IdleModeMobilityControlInfo           OPTIONAL,   -- Need OP
    nonCriticalExtension              SEQUENCE {}                           OPTIONAL    -- Need OP
}

ReleaseCause ::=                  ENUMERATED {loadBalancingTAUrequired,
                                      other,spare2, spare1 }
```

```
RedirectedCarrierInfo ::=            CHOICE {
    eutra                               ARFCN-ValueEUTRA,
    geran                               CarrierFreqsGERAN,
    utra-FDD                            ARFCN-ValueUTRA,
    utra-TDD                            ARFCN-ValueUTRA,
    cdma2000-HRPD                       CarrierFreqCDMA2000,
    cdma2000-1xRTT                      CarrierFreqCDMA2000,
    ...
}

IdleModeMobilityControlInfo ::=      SEQUENCE {
    freqPriorityListEUTRA               FreqPriorityListEUTRA        OPTIONAL,        -- Need ON
    freqPriorityListGERAN               FreqsPriorityListGERAN       OPTIONAL,        -- Need ON
    freqPriorityListUTRA-FDD            FreqPriorityListUTRA-FDD     OPTIONAL,        -- Need ON
    freqPriorityListUTRA-TDD            FreqPriorityListUTRA-TDD     OPTIONAL,        -- Need ON
    bandClassPriorityListHRPD           BandClassPriorityListHRPD    OPTIONAL,        -- Need ON
    bandClassPriorityList1XRTT          BandClassPriorityList1XRTT   OPTIONAL,        -- Need ON
    t320                                ENUMERATED {
                                            min5, min10, min20, min30, min60, min120, min180,
                                            spare1}                  OPTIONAL,        -- Need OR
    ...
}

FreqPriorityListEUTRA ::=            SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA

FreqPriorityEUTRA ::=               SEQUENCE {
    carrierFreq                         ARFCN-ValueEUTRA,
    cellReselectionPriority             CellReselectionPriority
}

FreqsPriorityListGERAN ::=          SEQUENCE (SIZE (1..maxGNFG)) OF FreqsPriorityGERAN

FreqsPriorityGERAN ::=              SEQUENCE {
    carrierFreqs                        CarrierFreqsGERAN,
    cellReselectionPriority             CellReselectionPriority
}

FreqPriorityListUTRA-FDD ::=        SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF FreqPriorityUTRA-FDD

FreqPriorityUTRA-FDD ::=            SEQUENCE {
    carrierFreq                         ARFCN-ValueUTRA,
    cellReselectionPriority             CellReselectionPriority
}

FreqPriorityListUTRA-TDD ::=        SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF FreqPriorityUTRA-TDD

FreqPriorityUTRA-TDD ::=            SEQUENCE {
    carrierFreq                         ARFCN-ValueUTRA,
    cellReselectionPriority             CellReselectionPriority
}

BandClassPriorityListHRPD ::=       SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassPriorityHRPD

BandClassPriorityHRPD ::=           SEQUENCE {
    bandClass                           BandclassCDMA2000,
    cellReselectionPriority             CellReselectionPriority
}

BandClassPriorityList1XRTT ::=  SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassPriority1XRTT

BandClassPriority1XRTT ::=      SEQUENCE {
    bandClass                           BandclassCDMA2000,
    cellReselectionPriority             CellReselectionPriority
}
-- ASN1STOP
```

***RRCConnectionRelease* field descriptions**
releaseCause
The *releaseCause* is used to indicate the reason for releasing the RRC Connection.
redirectedCarrierInfo
The r*edirectedCarrierInfo* indicates a carrier frequency (downlink for FDD) and is used to redirect the UE to another E-UTRA or an inter-RAT carrier frequency, by means of the cell selection upon leaving RRC_CONNECTED as specified in TS 36.304 [4].
idleModeMobilityControlInfo
Provides dedicated cell reselection priorities. Used for cell reselection as specified in TS 36.304 [4].
freqPriorityListX
Provides a cell reselection priority for each frequency, by means of separate lists for each RAT (including E-UTRA).
carrierFreq or bandClass
The carrier frequency (UTRA and E-UTRA) and band class (HRPD and 1xRTT) for which the associated cellReselectionPriority is applied.
t320
Timer T320 as described in section 7.3. Value minN corresponds to N minutes.
carrierFreqs
The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.

– *RRCConnectionRequest*

The *RRCConnectionRequest* message is used to request the establishment of an RRC connection.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E-UTRAN

***RRCConnectionRequest* message**

```
-- ASN1START

RRCConnectionRequest ::=            SEQUENCE {
    criticalExtensions                 CHOICE {
        rrcConnectionRequest-r8            RRCConnectionRequest-r8-IEs,
        criticalExtensionsFuture           SEQUENCE {}
    }
}

RRCConnectionRequest-r8-IEs ::=     SEQUENCE {
    ue-Identity                        InitialUE-Identity,
    establishmentCause                 EstablishmentCause,
    spare                              BIT STRING (SIZE (1))
}

InitialUE-Identity ::=              CHOICE {
    s-TMSI                             S-TMSI,
    randomValue                        BIT STRING (SIZE (40))
}

EstablishmentCause ::=              ENUMERATED {
                                       emergency, highPriorityAccess, mt-Access, mo-Signalling,
                                       mo-Data, spare3, spare2, spare1}

-- ASN1STOP
```

***RRCConnectionRequest* field descriptions**
ue-Identity
UE identity included to facilitate contention resolution by lower layers.
establishmentCause
Provides the establishment cause for the RRC connection request as provided by the upper layers. W.r.t. the cause value names: highPriorityAccess concerns AC11..AC15, 'mt' stands for 'Mobile Terminating' and 'mo' for 'Mobile Originating'.
randomValue
Integer value in the range 0 to $2^{40} - 1$.

– *RRCConnectionSetup*

The *RRCConnectionSetup* message is used to establish SRB1.

> Signalling radio bearer: SRB0

> RLC-SAP: TM

> Logical channel: CCCH

> Direction: E-UTRAN to UE

***RRCConnectionSetup* message**

```
-- ASN1START

RRCConnectionSetup ::=                SEQUENCE {
    rrc-TransactionIdentifier         RRC-TransactionIdentifier,
    criticalExtensions                CHOICE {
        c1                                CHOICE {
            rrcConnectionSetup-r8             RRCConnectionSetup-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture          SEQUENCE {}
    }
}

RRCConnectionSetup-r8-IEs ::=        SEQUENCE {
    radioResourceConfigDedicated       RadioResourceConfigDedicated,
    nonCriticalExtension               SEQUENCE {}                        OPTIONAL    -- Need OP
}

-- ASN1STOP
```

– *RRCConnectionSetupComplete*

The *RRCConnectionSetupComplete* message is used to confirm the successful completion of an RRC connection establishment.

> Signalling radio bearer: SRB1

> RLC-SAP: AM

> Logical channel: DCCH

> Direction: UE to E-UTRAN

***RRCConnectionSetupComplete* message**

```
-- ASN1START

RRCConnectionSetupComplete ::=        SEQUENCE {
    rrc-TransactionIdentifier          RRC-TransactionIdentifier,
    criticalExtensions                 CHOICE {
        c1                                 CHOICE{
            rrcConnectionSetupComplete-r8        RRCConnectionSetupComplete-r8-IEs,
```

```
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCConnectionSetupComplete-r8-IEs ::= SEQUENCE {
    selectedPLMN-Identity           INTEGER (1..6),
    registeredMME                   RegisteredMME                     OPTIONAL,
    dedicatedInfoNAS                DedicatedInfoNAS,
    nonCriticalExtension            SEQUENCE {}                       OPTIONAL
}

RegisteredMME ::=                   SEQUENCE {
    plmn-Identity                   PLMN-Identity                     OPTIONAL,
    mmegi                           BIT STRING (SIZE (16)),
    mmec                            MMEC
}

-- ASN1STOP
```

RRCConnectionSetupComplete field descriptions
selectedPLMN-Identity
Index of the PLMN selected by the UE from the *plmn-IdentityList* included in SIB1. 1 if the 1st PLMN is selected from the *plmn-IdentityList* included in SIB1, 2 if the 2nd PLMN is selected from the *plmn-IdentityList* included in SIB1 and so on.
registeredMME
This field is used to transfer the GUMMEI of the MME where the UE is registered, as provided by upper layers.
mmegi
Provides the Group Identity of the registered MME within the PLMN, as provided by upper layers, see TS 23.003 [27].

–   *SecurityModeCommand*

The *SecurityModeCommand* message is used to command the activation of AS security.

    Signalling radio bearer: SRB1

    RLC-SAP: AM

    Logical channel: DCCH

    Direction: E-UTRAN to UE

SecurityModeCommand message

```
-- ASN1START

SecurityModeCommand ::=             SEQUENCE {
    rrc-TransactionIdentifier       RRC-TransactionIdentifier,
    criticalExtensions              CHOICE {
        c1                              CHOICE{
            securityModeCommand-r8          SecurityModeCommand-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture        SEQUENCE {}
    }
}

SecurityModeCommand-r8-IEs ::=      SEQUENCE {
    securityConfigSMC               SecurityConfigSMC,
    nonCriticalExtension            SEQUENCE {}                       OPTIONAL    -- Need OP
}

SecurityConfigSMC ::=               SEQUENCE {
    securityAlgorithmConfig             SecurityAlgorithmConfig,
    ...
}

-- ASN1STOP
```

– *SecurityModeComplete*

The *SecurityModeComplete* message is used to confirm the successful completion of a security mode command.

   Signalling radio bearer: SRB1

   RLC-SAP: AM

   Logical channel: DCCH

   Direction: UE to E-UTRAN

SecurityModeComplete message

```
-- ASN1START

SecurityModeComplete ::=          SEQUENCE {
    rrc-TransactionIdentifier         RRC-TransactionIdentifier,
    criticalExtensions                CHOICE {
        securityModeComplete-r8           SecurityModeComplete-r8-IEs,
        criticalExtensionsFuture          SEQUENCE {}
    }
}

SecurityModeComplete-r8-IEs ::=   SEQUENCE {
    nonCriticalExtension              SEQUENCE {}                     OPTIONAL
}

-- ASN1STOP
```

– *SecurityModeFailure*

The *SecurityModeFailure* message is used to indicate an unsuccessful completion of a security mode command.

   Signalling radio bearer: SRB1

   RLC-SAP: AM

   Logical channel: DCCH

   Direction: UE to E-UTRAN

SecurityModeFailure message

```
-- ASN1START

SecurityModeFailure ::=           SEQUENCE {
    rrc-TransactionIdentifier         RRC-TransactionIdentifier,
    criticalExtensions                CHOICE {
        securityModeFailure-r8            SecurityModeFailure-r8-IEs,
        criticalExtensionsFuture          SEQUENCE {}
    }
}

SecurityModeFailure-r8-IEs ::=    SEQUENCE {
    nonCriticalExtension              SEQUENCE {}                     OPTIONAL
}

-- ASN1STOP
```

– *SystemInformation*

The *SystemInformation* message is used to convey one or more System Information Blocks. All the SIBs included are transmitted with the same periodicity.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E-UTRAN to UE

SystemInformation message

```
-- ASN1START

SystemInformation ::=                SEQUENCE {
    criticalExtensions                  CHOICE {
        systemInformation-r8                SystemInformation-r8-IEs,
        criticalExtensionsFuture            SEQUENCE {}
    }
}
SystemInformation-r8-IEs ::=         SEQUENCE {
    sib-TypeAndInfo                     SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {
        sib2                                SystemInformationBlockType2,
        sib3                                SystemInformationBlockType3,
        sib4                                SystemInformationBlockType4,
        sib5                                SystemInformationBlockType5,
        sib6                                SystemInformationBlockType6,
        sib7                                SystemInformationBlockType7,
        sib8                                SystemInformationBlockType8,
        sib9                                SystemInformationBlockType9,
        sib10                               SystemInformationBlockType10,
        sib11                               SystemInformationBlockType11,
        ...
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- ASN1STOP
```

– *SystemInformationBlockType1*

SystemInformationBlockType1 contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E-UTRAN to UE

SystemInformationBlockType1 message

```
-- ASN1START

SystemInformationBlockType1 ::=      SEQUENCE {
    cellAccessRelatedInfo               SEQUENCE {
        plmn-IdentityList                   PLMN-IdentityList,
        trackingAreaCode                    TrackingAreaCode,
        cellIdentity                        CellIdentity,
        cellBarred                          ENUMERATED {barred, notBarred},
        intraFreqReselection                ENUMERATED {allowed, notAllowed},
        csg-Indication                      BOOLEAN,
        csg-Identity                        BIT STRING (SIZE (27))  OPTIONAL    -- Need OR
    },
    cellSelectionInfo                   SEQUENCE {
        q-RxLevMin                          Q-RxLevMin,
        q-RxLevMinOffset                    INTEGER (1..8)          OPTIONAL    -- Need OP
    },
    p-Max                               P-Max                       OPTIONAL,           -- Need OP
    freqBandIndicator                   FreqBandIndicator,
    schedulingInfoList                  SchedulingInfoList,
    tdd-Config                          TDD-Config                  OPTIONAL,   -- Cond TDD
```

```
    si-WindowLength                    ENUMERATED {
                                          ms1, ms2, ms5, ms10, ms15, ms20,
                                          ms40},
    systemInfoValueTag                 INTEGER (0..31),
    nonCriticalExtension               SystemInformationBlockType1-v890-IEs
    OPTIONAL    -- Need OP
}

SystemInformationBlockType1-v890-IEs::= SEQUENCE {
    lateNonCriticalExtension           OCTET STRING (CONTAINING SystemInformationBlockType1-v8h0-
IEs)          OPTIONAL,   -- Need OP
    nonCriticalExtension               SEQUENCE {}        OPTIONAL
}

SystemInformationBlockType1-v8h0-IEs ::= SEQUENCE {
    multiBandInfoList                  MultiBandInfoList        OPTIONAL,   -- Need OR
    nonCriticalExtension               SEQUENCE {}              OPTIONAL    -- Need OP
}

PLMN-IdentityList ::=                  SEQUENCE (SIZE (1..6)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::=                  SEQUENCE {
    plmn-Identity                         PLMN-Identity,
    cellReservedForOperatorUse            ENUMERATED {reserved, notReserved}
}

SchedulingInfoList ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SchedulingInfo

SchedulingInfo ::=   SEQUENCE {
    si-Periodicity                     ENUMERATED {
                                          rf8, rf16, rf32, rf64, rf128, rf256, rf512},
    sib-MappingInfo                    SIB-MappingInfo
}

SIB-MappingInfo ::= SEQUENCE (SIZE (0..maxSIB-1)) OF SIB-Type

SIB-Type ::=                           ENUMERATED {
                                          sibType3, sibType4, sibType5, sibType6,
                                          sibType7, sibType8, sibType9, sibType10,
                                          sibType11, spare7, spare6, spare5,
                                          spare4, spare3, spare2, spare1, ...}

-- ASN1STOP
```

SystemInformationBlockType1 field descriptions
plmn-IdentityList
List of PLMN identities. The first listed *PLMN-Identity* is the primary PLMN.
cellReservedForOperatorUse
As defined in TS 36.304 [4].
trackingAreaCode
A *trackingAreaCode* that is common for all the PLMNs listed.
cellBarred
'barred' means the cell is barred, as defined in TS 36.304 [4].
intraFreqReselection
Used to control cell reselection to intra-frequency cells when the highest ranked cell is barred, or treated as barred by the UE, as specified in TS 36.304 [4].
multiBandInfoList
A list of additional frequency band indicators, including the frequency band indicated by *freqBandIndicator*, as defined in TS 36.101 [42, table 5.5-1] that the cell belongs to. If there are multiple bands supported by the UE, the UE shall apply the first listed band which it supports.
csg-Indication
If set to TRUE the UE is only allowed to access the cell if the CSG identity matches an entry in the allowed CSG list that the UE has stored.
q-RxLevMinOffset
Parameter $Q_{rxlevminoffset}$ in 36.304 [4]. Actual value $Q_{rxlevminoffset}$ = IE value * 2 [dB]. If absent, apply the (default) value of 0 [dB] for $Q_{rxlevminoffset}$. Affects the minimum required Rx level in the cell.
p-Max
Value applicable for the cell.
si-Periodicity
Periodicity of the SI-message in radio frames, such that rf8 denotes 8 radio frames, rf16 denotes 16 radio frames, and so on.
sib-MappingInfo
List of the SIBs mapped to this *SystemInformation* message.There is no mapping information of SIB2; it is always present in the first *SystemInformation* message listed in the *schedulingInfoList* list.
si-WindowLength
Common SI scheduling window for all SIs. Unit in milliseconds, where ms1 denotes 1 millisecond, ms2 denotes 2 milliseconds and so on.
systemInfoValueTag
Common for all SIBs other than MIB, SIB1, SIB10 and SIB11.
csg-Identity
Identity of the Closed Subscriber Group the cell belongs to. The IE is present in a CSG cell.

Conditional presence	Explanation
TDD	This field is mandatory present for TDD; it is not present for FDD and the UE shall delete any existing value for this field.

– *UECapabilityEnquiry*

The *UECapabilityEnquiry* message is used to request the transfer of UE radio access capabilities for E-UTRA as well as for other RATs.

    Signalling radio bearer: SRB1

    RLC-SAP: AM

    Logical channel: DCCH

    Direction: E-UTRAN to UE

UECapabilityEnquiry message

```
-- ASN1START

UECapabilityEnquiry ::=              SEQUENCE {
    rrc-TransactionIdentifier        RRC-TransactionIdentifier,
    criticalExtensions               CHOICE {
        c1                               CHOICE {
            ueCapabilityEnquiry-r8           UECapabilityEnquiry-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
```

```
            criticalExtensionsFuture           SEQUENCE {}
    }
}

UECapabilityEnquiry-r8-IEs ::=       SEQUENCE {
    ue-CapabilityRequest                UE-CapabilityRequest,
    nonCriticalExtension                SEQUENCE {}                          OPTIONAL    -- Need OP
}

UE-CapabilityRequest ::=        SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT-Type

-- ASN1STOP
```

UECapabilityEnquiry field descriptions
ue-CapabilityRequest
List of the RATs for which the UE is requested to transfer the UE radio access capabilities i.e. E-UTRA, UTRA, GERAN-CS, GERAN-PS, CDMA2000.

– *UECapabilityInformation*

The *UECapabilityInformation* message is used to transfer of UE radio access capabilities requested by the E-UTRAN.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

UECapabilityInformation **message**

```
-- ASN1START

UECapabilityInformation ::=         SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            ueCapabilityInformation-r8          UECapabilityInformation-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

UECapabilityInformation-r8-IEs ::=  SEQUENCE {
    ue-CapabilityRAT-ContainerList      UE-CapabilityRAT-ContainerList,
    nonCriticalExtension                SEQUENCE {}                          OPTIONAL
}

-- ASN1STOP
```


– *ULHandoverPreparationTransfer (CDMA2000)*

The *ULHandoverPreparationTransfer* message is used for the uplink transfer of handover related CDMA2000 information when requested by the higher layers.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

ULHandoverPreparationTransfer message

```
-- ASN1START

ULHandoverPreparationTransfer ::=    SEQUENCE {
    criticalExtensions                CHOICE {
        c1                                CHOICE {
            ulHandoverPreparationTransfer-r8     ULHandoverPreparationTransfer-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture          SEQUENCE {}
    }
}

ULHandoverPreparationTransfer-r8-IEs ::= SEQUENCE {
    cdma2000-Type                     CDMA2000-Type,
    meid                              BIT STRING (SIZE (56))  OPTIONAL,
    dedicatedInfo                     DedicatedInfoCDMA2000,
    nonCriticalExtension              SEQUENCE {}                     OPTIONAL
}

-- ASN1STOP
```

ULHandoverPreparationTransfer field descriptions
meid
The 56 bit mobile identification number provided by the CDMA2000 Upper layers.

– *ULInformationTransfer*

The *ULInformationTransfer* message is used for the uplink transfer of dedicated NAS information.

Signalling radio bearer: SRB2 or SRB1(only if SRB2 not established yet). If SRB2 is suspended, the UE does not send this message until SRB2 is resumed

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

ULInformationTransfer message

```
-- ASN1START

ULInformationTransfer ::=          SEQUENCE {
    criticalExtensions                CHOICE {
        c1                                CHOICE {
            ulInformationTransfer-r8          ULInformationTransfer-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture          SEQUENCE {}
    }
}

ULInformationTransfer-r8-IEs ::=    SEQUENCE {
    dedicatedInfoType        CHOICE {
        dedicatedInfoNAS                  DedicatedInfoNAS,
        dedicatedInfoCDMA2000-1XRTT       DedicatedInfoCDMA2000,
        dedicatedInfoCDMA2000-HRPD        DedicatedInfoCDMA2000
    },
    nonCriticalExtension              SEQUENCE {}                     OPTIONAL
}
```

```
-- ASN1STOP
```

6.3 RRC information elements

6.3.1 System information blocks

– *SystemInformationBlockType2*

The IE *SystemInformationBlockType2* contains radio resource configuration information that is common for all UEs.

NOTE: UE timers and constants related to functionality for which parameters are provided in another SIB are included in the corresponding SIB.

SystemInformationBlockType2 information element

```
-- ASN1START

SystemInformationBlockType2 ::=     SEQUENCE {
    ac-BarringInfo                      SEQUENCE {
        ac-BarringForEmergency              BOOLEAN,
        ac-BarringForMO-Signalling          AC-BarringConfig          OPTIONAL,  -- Need OP
        ac-BarringForMO-Data                AC-BarringConfig          OPTIONAL   -- Need OP
    }                                                                 OPTIONAL,  -- Need OP
    radioResourceConfigCommon           RadioResourceConfigCommonSIB,
    ue-TimersAndConstants               UE-TimersAndConstants,
    freqInfo                            SEQUENCE {
        ul-CarrierFreq                      ARFCN-ValueEUTRA          OPTIONAL,  -- Need OP
        ul-Bandwidth                        ENUMERATED {n6, n15, n25, n50, n75, n100}
                                                                      OPTIONAL,  -- Need OP
        additionalSpectrumEmission          AdditionalSpectrumEmission
    },
    mbsfn-SubframeConfigList             MBSFN-SubframeConfigList       OPTIONAL,  -- Need OR
    timeAlignmentTimerCommon             TimeAlignmentTimer,
    ...,
    lateNonCriticalExtension            OCTET STRING (CONTAINING SystemInformationBlockType2-v8h0-IEs)
                        OPTIONAL     -- Need OP
}

SystemInformationBlockType2-v8h0-IEs ::=    SEQUENCE {
    multiBandInfoList                   SEQUENCE (SIZE (1..maxMultiBands)) OF AdditionalSpectrumEmission
    OPTIONAL,    -- Need OR
    nonCriticalExtension                SEQUENCE {}                               OPTIONAL     -- Need OP
}

AC-BarringConfig ::=                SEQUENCE {
    ac-BarringFactor                    ENUMERATED {
                                            p00, p05, p10, p15, p20, p25, p30, p40,
                                            p50, p60, p70, p75, p80, p85, p90, p95},
    ac-BarringTime                      ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512},
    ac-BarringForSpecialAC              BIT STRING (SIZE(5))
}

MBSFN-SubframeConfigList ::=        SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-
SubframeConfig

MBSFN-SubframeConfig ::=            SEQUENCE {
    radioframeAllocationPeriod          ENUMERATED {n1, n2, n4, n8, n16, n32},
    radioframeAllocationOffset          INTEGER (0..7),
    subframeAllocation                  CHOICE {
        oneFrame                            BIT STRING (SIZE(6)),
        fourFrames                          BIT STRING (SIZE(24))
    }
}
-- ASN1STOP
```

SystemInformationBlockType2 field descriptions
ac-BarringForEmergency
Access class barring for AC 10.
ac-BarringForMO-Signalling
Access class barring for mobile originating signalling.
ac-BarringForMO-Data
Access class barring for mobile originating calls.
ac-BarringFactor
If the random number drawn by the UE is lower than this value, access is allowed. Otherwise the access is barred. The values are interpreted in the range [0,1): p00 = 0, p05 = 0.05, p10 = 0.10,…,p95 = 0.95. Values other than 'p00' can only be set if all bits of the corresponding *ac-BarringForSpecialAC* are set to 0.
ac-BarringTime
Mean access barring time value in seconds.
ac-BarringForSpecialAC
Access class barring for AC 11-15. The first/ leftmost bit is for AC 11, the second bit is for AC 12, and so on.
ul-CarrierFreq
For FDD: If absent, the (default) value determined from the default TX-RX frequency separation defined in TS 36.101 [42, table 5.7.3-1] applies. For TDD: This parameter is absent and it is equal to the downlink frequency.
ul-Bandwidth
Parameter: transmission bandwidth configuration, N_{RB}, in uplink, see TS 36.101 [42, table 5.6-1]. Value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If for FDD this parameter is absent, the uplink bandwidth is equal to the downlink bandwidth. For TDD this parameter is absent and it is equal to the downlink bandwidth.
mbsfn-SubframeConfigList
Defines the subframes that are reserved for MBSFN in downlink.
multiBandInfoList
A list of *additionalSpectrumEmission* i.e. one for each additional frequency band included in *multiBandInfoList* in *SystemInformationBlockType1,* listed in the same order.
radioFrameAllocationPeriod, radioFrameAllocationOffset
Radio-frames that contain MBSFN subframes occur when equation *SFN* mod *radioFrameAllocationPeriod* = *radioFrameAllocationOffset* is satisfied. Value n1 for *radioframeAllocationPeriod* denotes value 1, n2 denotes value 2, and so on. When *fourFrames* is used for *subframeAllocation*, the equation defines the first radio frame referred to in the description below. Values *n1* and *n2* are not applicable when *fourFrames* is used.
subframeAllocation
Defines the subframes that are allocated for MBSFN within the radio frame allocation period defined by the *radioFrameAllocationPeriod* and the *radioFrameAllocationOffset.*
oneFrame
"1" denotes that the corresponding subframe is allocated for MBSFN. The following mapping applies: FDD: The first/leftmost bit defines the MBSFN allocation for subframe #1, the second bit for #2, third bit for #3 , fourth bit for #6, fifth bit for #7, sixth bit for #8. TDD: The first/leftmost bit defines the allocation for subframe #3, the second bit for #4, third bit for #7, fourth bit for #8, fifth bit for #9. Uplink subframes are not allocated. The last bit is not used.
fourFrames
A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows: FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #1, #2, #3 , #6, #7, and #8 in the sequence of the four radio-frames. TDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #3, #4, #7, #8, and #9 in the sequence of the four radio-frames. The last four bits are not used. Uplink subframes are not allocated.

– *SystemInformationBlockType3*

The IE *SystemInformationBlockType3* contains cell re-selection information common for intra-frequency, inter-frequency and/ or inter-RAT cell re-selection (i.e. applicable for more than one type of cell re-selection but not necessarily all) as well as intra-frequency cell re-selection information other than neighbouring cell related.

SystemInformationBlockType3 information element

```
-- ASN1START

SystemInformationBlockType3 ::=       SEQUENCE {
    cellReselectionInfoCommon                 SEQUENCE {
        q-Hyst                                    ENUMERATED {
                                                      dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10,
```

```
                                                     dB12, dB14, dB16, dB18, dB20, dB22, dB24},
        speedStateReselectionPars            SEQUENCE {
            mobilityStateParameters              MobilityStateParameters,
            q-HystSF                             SEQUENCE {
                sf-Medium                            ENUMERATED {
                                                         dB-6, dB-4, dB-2, dB0},
                sf-High                              ENUMERATED {
                                                         dB-6, dB-4, dB-2, dB0}
            }
        }                                                        OPTIONAL       -- Need OP
    },
    cellReselectionServingFreqInfo           SEQUENCE {
        s-NonIntraSearch                         ReselectionThreshold        OPTIONAL,     -- Need OP
        threshServingLow                         ReselectionThreshold,
        cellReselectionPriority                  CellReselectionPriority
    },
    intraFreqCellReselectionInfo             SEQUENCE {
        q-RxLevMin                               Q-RxLevMin,
        p-Max                                    P-Max                       OPTIONAL,     -- Need OP
        s-IntraSearch                            ReselectionThreshold        OPTIONAL,     -- Need OP
        allowedMeasBandwidth                     AllowedMeasBandwidth        OPTIONAL,     -- Need OP
        presenceAntennaPort1                     PresenceAntennaPort1,
        neighCellConfig                          NeighCellConfig,
        t-ReselectionEUTRA                       T-Reselection,
        t-ReselectionEUTRA-SF                    SpeedStateScaleFactors      OPTIONAL      -- Need OP
    },
    ...
}

-- ASN1STOP
```

SystemInformationBlockType3 field descriptions
cellReselectionInfoCommon   Cell re-selection information common for cells.
q-Hyst   Parameter Q_{hyst} in 36.304 [4], Value in dB. Value dB1 corresponds to 1 dB, dB2 corresponds to 2 dB and so on.
speedStateReselectionPars   Speed dependent reselection parameters, see TS 36.304 [4]. If this field is absent, i.e, *mobilityStateParameters* is also not present, UE behaviour is specified in TS 36.304 [4].
q-HystSF   Parameter "Speed dependent ScalingFactor for Q_{hyst}" in TS 36.304 [4]. The sf-Medium and sf-High concern the additional hysteresis to be applied, in Medium and High Mobility state respectively, to Q_{hyst} as defined in TS 36.304 [4]. In dB. Value dB-6 corresponds to -6dB, dB-4 corresponds to -4dB and so on.
t-ReselectionEUTRA   Parameter "Treselection$_{EUTRAN}$" in TS 36.304 [4].
t-ReselectionEUTRA-SF   Parameter "Speed dependent ScalingFactor for Treselection$_{EUTRAN}$" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
s-IntraSearch   Parameter $S_{intrasearch}$, see TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
cellReselectionServingFreqInfo   Information common for Cell re-selection to inter-frequency and inter-RAT cells.
s-NonIntraSearch   Parameter $S_{nonintrasearch}$, see TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
threshServingLow   Parameter Thresh$_{serving, low}$, see TS 36.304 [4].
intraFreqcellReselectionInfo   Cell re-selection information common for intra-frequency cells.
p-Max   Value applicable for the intra-frequency neighbouring E-UTRA cells.
allowedMeasBandwidth   If absent, the value corresponding to the downlink bandwidth indicated by the *dl-Bandwidth* included in *MasterInformationBlock* applies.

– *SystemInformationBlockType4*

The IE *SystemInformationBlockType4* contains neighbouring cell related information relevant only for intra-frequency cell re-selection. The IE includes cells with specific re-selection parameters as well as blacklisted cells.

SystemInformationBlockType4 information element

```
-- ASN1START

SystemInformationBlockType4 ::=     SEQUENCE {
    intraFreqNeighCellList              IntraFreqNeighCellList     OPTIONAL,   -- Need OR
    intraFreqBlackCellList              IntraFreqBlackCellList         OPTIONAL,   -- Need OR
    csg-PhysCellIdRange                 PhysCellIdRange           OPTIONAL,   -- Cond CSG
    ...
}

IntraFreqNeighCellList ::=     SEQUENCE (SIZE (1..maxCellIntra)) OF IntraFreqNeighCellInfo

IntraFreqNeighCellInfo ::=        SEQUENCE {
    physCellId                          PhysCellId,
    q-OffsetCell                        Q-OffsetRange,
    ...
}

IntraFreqBlackCellList ::=        SEQUENCE (SIZE (1..maxCellBlack)) OF PhysCellIdRange

-- ASN1STOP
```

SystemInformationBlockType4 field descriptions
intraFreqNeighbCellList
List of intra-frequency neighbouring cells with specific cell re-selection parameters.
q-OffsetCell
Parameter "Qoffset$_{s,n}$" in TS 36.304 [4].
intraFreqBlackCellList
List of blacklisted intra-frequency neighbouring cells.
csg-PhysCellIdRange
Set of physical cell identities reserved for CSG cells on the frequency on which this field was received. The received *csg-PhysCellIdRange* applies if less than 24 hours has elapsed since it was received and it was received in the same primary PLMN. The 3 hour validity restriction (section 5.2.1.3) does not apply to this field.

Conditional presence	Explanation
CSG	This field is optional, need OP, for non-CSG cells, and mandatory for CSG cells.

– SystemInformationBlockType5

The IE *SystemInformationBlockType5* contains information relevant only for inter-frequency cell re-selection i.e. information about other E-UTRA frequencies and inter-frequency neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

SystemInformationBlockType5 information element

```
-- ASN1START

SystemInformationBlockType5 ::=     SEQUENCE {
    interFreqCarrierFreqList            InterFreqCarrierFreqList,
    ...,
    lateNonCriticalExtension           OCTET STRING (CONTAINING SystemInformationBlockType5-v8h0-IEs)
                        OPTIONAL     -- Need OP
}

SystemInformationBlockType5-v8h0-IEs ::=     SEQUENCE {
    interFreqCarrierFreqList-v8h0 SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v8h0
        OPTIONAL,   -- Need OP
    nonCriticalExtension                SEQUENCE {}                           OPTIONAL     -- Need OP
}

InterFreqCarrierFreqList ::=          SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo

InterFreqCarrierFreqInfo ::=     SEQUENCE {
    dl-CarrierFreq                      ARFCN-ValueEUTRA,
    q-RxLevMin                          Q-RxLevMin,
    p-Max                               P-Max                     OPTIONAL,       -- Need OP
    t-ReselectionEUTRA                  T-Reselection,
    t-ReselectionEUTRA-SF               SpeedStateScaleFactors    OPTIONAL,       -- Need OP
```

```
    threshX-High                    ReselectionThreshold,
    threshX-Low                     ReselectionThreshold,
    allowedMeasBandwidth            AllowedMeasBandwidth,
    presenceAntennaPort1            PresenceAntennaPort1,
    cellReselectionPriority         CellReselectionPriority     OPTIONAL,       -- Need OP
    neighCellConfig                 NeighCellConfig,
    q-OffsetFreq                    Q-OffsetRange               DEFAULT dB0,
    interFreqNeighCellList          InterFreqNeighCellList      OPTIONAL,       -- Need OR
    interFreqBlackCellList          InterFreqBlackCellList      OPTIONAL,       -- Need OR
    ...
}

InterFreqCarrierFreqInfo-v8h0 ::=     SEQUENCE {
    multiBandInfoList               MultiBandInfoList           OPTIONAL     -- Need OR
}

InterFreqNeighCellList ::=          SEQUENCE (SIZE (1..maxCellInter)) OF InterFreqNeighCellInfo

InterFreqNeighCellInfo ::=          SEQUENCE {
    physCellId                      PhysCellId,
    q-OffsetCell                    Q-OffsetRange
}

InterFreqBlackCellList ::=          SEQUENCE (SIZE (1..maxCellBlack)) OF PhysCellIdRange

-- ASN1STOP
```

SystemInformationBlockType5 field descriptions
p-Max
Value applicable for the neighbouring E-UTRA cells on this carrier frequency.
threshX-High
Parameter "Thresh$_{x,high}$", see TS 36.304 [4].
threshX-Low
Parameter "Thresh$_{x,low}$", see TS 36.304 [4].
t-ReselectionEUTRA
Parameter "Treselection$_{EUTRAN}$" in TS 36.304 [4].
t-ReselectionEUTRA-SF
Parameter "Speed dependent ScalingFactor for Treselection$_{EUTRAN}$" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
q-OffsetFreq
Parameter "Qoffset$_{frequency}$" in TS 36.304 [4].
interFreqNeighCellList
List of inter-frequency neighbouring cells with specific cell re-selection parameters.
q-OffsetCell
Parameter "Qoffset$_{s,n}$" in TS 36.304 [4].
interFreqBlackCellList
List of blacklisted inter-frequency neighbouring cells.
interFreqCarrierFreqList-v8h0
One entry corresponding to each supported carrier frequency listed in the same order as in *interFreqCarrierFreqList*.
multiBandInfoList
Indicates the list of frequency bands in addition to the band represented by *dl-CarrierFreq* for which cell reselection parameters are common.

– *SystemInformationBlockType6*

The IE *SystemInformationBlockType6* contains information relevant only for inter-RAT cell re-selection i.e. information about UTRA frequencies and UTRA neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency.

SystemInformationBlockType6 information element

```
-- ASN1START

SystemInformationBlockType6 ::=     SEQUENCE {
    carrierFreqListUTRA-FDD         CarrierFreqListUTRA-FDD     OPTIONAL,       -- Need OR
    carrierFreqListUTRA-TDD         CarrierFreqListUTRA-TDD     OPTIONAL,       -- Need OR
    t-ReselectionUTRA               T-Reselection,
    t-ReselectionUTRA-SF            SpeedStateScaleFactors      OPTIONAL,       -- Need OP
    ...,
```

```
        lateNonCriticalExtension        OCTET STRING (CONTAINING SystemInformationBlockType6-v8h0-IEs)
                            OPTIONAL     -- Need OP
}

SystemInformationBlockType6-v8h0-IEs ::=    SEQUENCE {
    carrierFreqListUTRA-FDD-v8h0 SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqInfoUTRA-
FDD-v8h0 OPTIONAL,    -- Need OR
    nonCriticalExtension            SEQUENCE {}                          OPTIONAL    -- Need OP
}

CarrierFreqListUTRA-FDD ::=     SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqUTRA-FDD

CarrierFreqUTRA-FDD ::=     SEQUENCE {
    carrierFreq                     ARFCN-ValueUTRA,
    cellReselectionPriority         CellReselectionPriority         OPTIONAL,       -- Need OP
    threshX-High                    ReselectionThreshold,
    threshX-Low                     ReselectionThreshold,
    q-RxLevMin                      INTEGER (-60..-13),
    p-MaxUTRA                       INTEGER (-50..33),
    q-QualMin                       INTEGER (-24..0),
    ...
}

CarrierFreqInfoUTRA-FDD-v8h0 ::=            SEQUENCE {
    multiBandInfoList               SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator-UTRA-FDD
             OPTIONAL    -- Need OR
}

CarrierFreqListUTRA-TDD ::=     SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF CarrierFreqUTRA-TDD

CarrierFreqUTRA-TDD ::=     SEQUENCE {
    carrierFreq                     ARFCN-ValueUTRA,
    cellReselectionPriority         CellReselectionPriority         OPTIONAL,       -- Need OP
    threshX-High                    ReselectionThreshold,
    threshX-Low                     ReselectionThreshold,
    q-RxLevMin                      INTEGER (-60..-13),
    p-MaxUTRA                       INTEGER (-50..33),
    ...
}

FreqBandIndicator-UTRA-FDD ::=              INTEGER (1..86)

-- ASN1STOP
```

SystemInformationBlockType6 field descriptions
t-ReselectionUTRA   Parameter "Treselection$_{UTRAN}$" in TS 36.304 [4].
t-ReselectionUTRA-SF   Parameter "Speed dependent ScalingFactor for Treselection$_{UTRA}$" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
carrierFreqListUTRA-FDD-v8h0   One entry corresponding to each supported UTRA FDD carrier frequency listed in the same order as in *carrierFreqListUTRA-FDD.*
carrierFreqListUTRA-FDD   List of carrier frequencies of UTRA FDD.
carrierFreqListUTRA-TDD   List of carrier frequencies of UTRA TDD.
multiBandInfoList   Indicates the list of frequency bands in addition to the band represented by *carrierFreq* in the *CarrierFreqUTRA-FDD* for which UTRA cell reselection parameters are common
threshX-High   Parameter "Thresh$_{x,high}$" in TS 36.304 [4].
threshX-Low   Parameter "Thresh$_{x,low}$" in TS 36.304 [4].
q-RxLevMin   Parameter $Q_{rxlevmin}$, see TS 25.304 [40]. Actual value = IE value * 2+1. Specifies the minimum required Rx level in the cell expressedin dBm.
p-MaxUTRA   The maximum allowed transmission power on the (uplink) carrier frequency, see TS 25.304 [40]. In dBm
q-QualMin   Parameter "*Qqualmin*" in TS 25.304 [40]. In dB.

– *SystemInformationBlockType7*

The IE *SystemInformationBlockType7* contains information relevant only for inter-RAT cell re-selection i.e. information about GERAN frequencies relevant for cell re-selection. The IE includes cell re-selection parameters for each frequency.

SystemInformationBlockType7 information element

```
-- ASN1START

SystemInformationBlockType7 ::=        SEQUENCE {
    t-ReselectionGERAN                     T-Reselection,
    t-ReselectionGERAN-SF                  SpeedStateScaleFactors        OPTIONAL,   -- Need OR
    carrierFreqsInfoList                   CarrierFreqsInfoListGERAN     OPTIONAL,   -- Need OR
    ...
}

CarrierFreqsInfoListGERAN ::=          SEQUENCE (SIZE (1..maxGNFG)) OF CarrierFreqsInfoGERAN

CarrierFreqsInfoGERAN ::=              SEQUENCE {
    carrierFreqs                           CarrierFreqsGERAN,
    commonInfo                             SEQUENCE {
        cellReselectionPriority                CellReselectionPriority   OPTIONAL,   -- Need OP
        ncc-Permitted                          BIT STRING (SIZE (8)),
        q-RxLevMin                             INTEGER (0..45),
        p-MaxGERAN                             INTEGER (0..39)           OPTIONAL,   -- Need OP
        threshX-High                           ReselectionThreshold,
        threshX-Low                            ReselectionThreshold
    },
    ...
}

-- ASN1STOP
```

SystemInformationBlockType7 field descriptions
carrierFreqsInfoList
Provides a list of neighbouring GERAN carrier frequencies, which may be monitored for neighbouring GERAN cells. The GERAN carrier frequencies are organised in groups and the cell reselection parameters are provided per group of GERAN carrier frequencies.
carrierFreqs
The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.
commonInfo
Defines the set of cell reselection parameters for the group of GERAN carrier frequencies.
t-ReselectionGERAN
Parameter "Treselection$_{GERAN}$" in TS 36.304 [4].
t-ReselectionGERAN-SF
Parameter "Speed dependent ScalingFactor for Treselection$_{GERAN}$" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
ncc-Permitted
Field encoded as a bit map, where bit N is set to "0" if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to "1" if the BCCH carrier with NCC = N-1 is permitted for monitoring; N = 1 to 8; bit 1 of the bitmap is the leading bit of the bit string.
q-RxLevMin
Parameter "Q$_{rxlevmin}$" in TS 45.008 [28]. The actual value of Q$_{rxlevmin}$ in dBm = (IE value * 2) − 115.
p-MaxGERAN
Maximum allowed transmission power for GERAN on an uplink carrier frequency, see TS 45.008 [28]. Value in dBm. Applicable for the neighbouring GERAN cells on this carrier frequency. If *pmaxGERAN* is absent, the maximum power according to the UE capability is used.
threshX-High
Parameter "Thresh$_{x,high}$" in TS 36.304 [4].
threshX-Low
Parameter "Thresh$_{x,low}$" in TS 36.304 [4].

– *SystemInformationBlockType8*

The IE *SystemInformationBlockType8* contains information relevant only for inter-RAT cell re-selection i.e. information about CDMA2000 frequencies and CDMA2000 neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

SystemInformationBlockType8 information element

```
-- ASN1START

SystemInformationBlockType8 ::=      SEQUENCE {
    systemTimeInfo                   SystemTimeInfoCDMA2000                OPTIONAL,  -- Need OR
    searchWindowSize                 INTEGER (0..15)                      OPTIONAL,  -- Need OR
    parametersHRPD                   SEQUENCE {
        preRegistrationInfoHRPD          PreRegistrationInfoHRPD,
        cellReselectionParametersHRPD    CellReselectionParametersCDMA2000  OPTIONAL -- Need OR
    }                                                                     OPTIONAL,  -- Need OR
    parameters1XRTT                  SEQUENCE {
        csfb-RegistrationParam1XRTT      CSFB-RegistrationParam1XRTT        OPTIONAL,  -- Need OP
        longCodeState1XRTT               BIT STRING (SIZE (42))             OPTIONAL,  -- Need OR
        cellReselectionParameters1XRTT   CellReselectionParametersCDMA2000  OPTIONAL -- Need OR
    }                                                                     OPTIONAL,  -- Need OR
    ...
}

CellReselectionParametersCDMA2000 ::= SEQUENCE {
    bandClassList                    BandClassListCDMA2000,
    neighCellList                    NeighCellListCDMA2000,
    t-ReselectionCDMA2000            T-Reselection,
    t-ReselectionCDMA2000-SF         SpeedStateScaleFactors               OPTIONAL   -- Need OP
}
NeighCellListCDMA2000 ::=            SEQUENCE (SIZE (1..16)) OF NeighCellCDMA2000

NeighCellCDMA2000 ::=   SEQUENCE {
    bandClass                        BandclassCDMA2000,
    neighCellsPerFreqList                NeighCellsPerBandclassListCDMA2000
}

NeighCellsPerBandclassListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF NeighCellsPerBandclassCDMA2000

NeighCellsPerBandclassCDMA2000 ::=  SEQUENCE {
    arfcn                            ARFCN-ValueCDMA2000,
    physCellIdList                   PhysCellIdListCDMA2000
}

PhysCellIdListCDMA2000 ::=          SEQUENCE (SIZE (1..16)) OF PhysCellIdCDMA2000

BandClassListCDMA2000 ::=           SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassInfoCDMA2000

BandClassInfoCDMA2000 ::=   SEQUENCE {
    bandClass                        BandclassCDMA2000,
    cellReselectionPriority          CellReselectionPriority              OPTIONAL,  -- Need OP
    threshX-High                     INTEGER (0..63),
    threshX-Low                      INTEGER (0..63),
    ...
}

-- ASN1STOP
```

SystemInformationBlockType8 field descriptions
systemTimeInfo
Information on CDMA2000 system time. This field is required for a UE with *rx-ConfigHRPD*= `single' and/ or *rx-Config1XRTT*= `single' to perform handover, cell re-selection and UE measurement based redirection from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4]. This field is excluded when estimating changes in system information, i.e. changes of *systemTimeInfo* should neither result in system information change notifications nor in a modification of *systemInfoValueTag* in SIB1.
searchWindowSize
The search window size is a CDMA2000 parameter to be used to assist in searching for the neighbouring pilots. For values see C.S0005-A [25, Table 2.6.6.2.1-1] and C.S0024-A [26, Table 8.7.6.2-4]. This field is required for a UE with *rx-ConfigHRPD*= `single' and/ or *rx-Config1XRTT*= `single' to perform handover, cell re-selection and UE measurement based redirection from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4].

***SystemInformationBlockType8* field descriptions**
parametersHRPD
Parameters applicable only for interworking with CDMA2000 HRPD systems.
preRegistrationInfoHRPD
The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.
cellReselectionParametersHRPD
Cell reselection parameters applicable for cell reselection to CDMA2000 HRPD system
bandClassList
List of CDMA2000 frequency bands.
bandClass
Identifies the Frequency Band in which the Carrier can be found. Details can be found in C.S0057-B [24, Table 1.5].
threshX-High
Parameter "Thresh$_{x,high}$" in TS 36.304 [4]. This specifies the high threshold used in reselection towards this CDMA2000 band class expressed as an unsigned binary number equal to FLOOR (-2 x 10 x $\log_{10}$ E$_c$/I$_o$) in units of 0.5 dB, as defined in C.S0005-A [25].
threshX-Low
Parameter "Thresh$_{x,low}$" in TS 36.304 [4]. This specifies the low threshold used in reselection towards this CDMA2000 band class expressed as an unsigned binary number equal to FLOOR (-2 x 10 x $\log_{10}$ E$_c$/I$_o$) in units of 0.5 dB, as defined in C.S0005-A [25].
t-ReselectionCDMA2000
Parameter "Treselection$_{CDMA\_HRPD}$" or "Treselection$_{CDMA\_1xRTT}$" in TS 36.304 [4].
t-ReselectionCDMA2000-SF
Parameter "Speed dependent ScalingFactor for Treselection$_{CDMA-HRPD}$" or Treselection$_{CDMA-1xRTT}$" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
neighCellList
List of CDMA2000 neighbouring cells. The total number of neighbouring cells in *neighCellList* for each RAT (1XRTT or HRPD) is limited to 32.
parameters1XRTT
Parameters applicable for interworking with CDMA2000 1XRTT system.
csfb-RegistrationParam1XRTT
Contains the parameters the UE will use to determine if it should perform a CDMA2000 1xRTT Registration/Re-Registration. This field is included if CSFB to CDMA2000 1xRTT is supported.
longCodeState1XRTT
The state of long code generation registers in CDMA2000 1XRTT system as defined in C.S0002-A [12, Section 1.3] at $\lceil t/10 \rceil \times 10 + 320$ ms, where *t* equals to the *cdma-SystemTime*. This field is required for SRVCC handover to CDMA2000 1xRTT operation. Otherwise this IE is not needed. This field is excluded when estimating changes in system information, i.e. changes of *longCodeState1XRTT* should neither result in system information change notifications nor in a modification of *systemInfoValueTag* in SIB1.
cellReselectionParameters1XRTT
Cell reselection parameters applicable only to CDMA2000 1xRTT system.
NeighCellListCDMA2000
List of CDMA2000 1xRTT or of CDMA2000 HRPD neighbouring cells.
neighCellsPerFreqList
List of carrier frequencies and neighbour cell ids in each frequency within a CDMA2000 Band, see C.S0002-A [12].
physCellIdList
Identifies the list of CDMA2000 cells ids, see C.S0002-A [12].

–   *SystemInformationBlockType9*

The IE *SystemInformationBlockType9* contains a home eNB name (HNB Name).

SystemInformationBlockType9 information element

```
-- ASN1START
```

```
SystemInformationBlockType9 ::=      SEQUENCE {
    hnb-Name                            OCTET STRING (SIZE(1..48))      OPTIONAL,   -- Need OR
    ...
}

-- ASN1STOP
```

SystemInformationBlockType9 field descriptions
hnb-Name
Carries the name of the home eNB, coded in UTF-8 with variable number of bytes per character, see TS 22.011 [10].

– *SystemInformationBlockType10*

The IE *SystemInformationBlockType10* contains an ETWS primary notification.

SystemInformationBlockType10 information element

```
-- ASN1START

SystemInformationBlockType10 ::=     SEQUENCE {
    messageIdentifier                   BIT STRING (SIZE (16)),
    serialNumber                        BIT STRING (SIZE (16)),
    warningType                         OCTET STRING (SIZE (2)),
    warningSecurityInfo                 OCTET STRING (SIZE (50))        OPTIONAL,        -- Need OP
    ...
}

-- ASN1STOP
```

SystemInformationBlockType10 field descriptions
messageIdentifier
Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.2], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.
serialNumber
Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.1], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.
warningType
Identifies the warning type of the ETWS primary notification and provides information on emergency user alert and UE popup. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.50]) contains the first octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.24], and so on.
warningSecurityInfo
Provides security information for the ETWS notification. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.51]) contains the fiest octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.25], and so on.

– *SystemInformationBlockType11*

The IE *SystemInformationBlockType11* contains an ETWS secondary notification.

SystemInformationBlockType11 information element

```
-- ASN1START

SystemInformationBlockType11 ::=     SEQUENCE {
    messageIdentifier                   BIT STRING (SIZE (16)),
    serialNumber                        BIT STRING (SIZE (16)),
    warningMessageSegmentType           ENUMERATED {notLastSegment, lastSegment},
    warningMessageSegmentNumber         INTEGER (0..63),
```

```
    warningMessageSegment             OCTET STRING,
    dataCodingScheme                  OCTET STRING (SIZE (1))        OPTIONAL,  -- Cond Segment1
    ...
}

-- ASN1STOP
```

SystemInformationBlockType11 field descriptions
messageIdentifier
Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.2], while the trailing bit contains bit 0 of second octet of the same equivalent IE.
serialNumber
Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.1], while the trailing bit contains bit 0 of second octet of the same equivalent IE.
warningMessageSegmentType
Indicates whether the included ETWS warning message segment is the last segment or not.
warningMessageSegmentNumber
Segment number of the ETWS warning message segment contained in the SIB. A segment number of zero corresponds to the first segment, one corresponds to the second segment, and so on.
warningMessageSegment
Carries a segment of the *Warning Message Contents* IE defined in TS 36.413 [39, 9.2.1.53]. The first octet of the *Warning Message Contents* IE is equivalent to the first octet of the *CB data* IE defined in and encoded according to TS 23.041 [37, 9.4.2.2.5] and so on.
dataCodingScheme
Identifies the alphabet/coding and the language applied variations of an ETWS notification. The octet (which is equivalent to the octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.52]) contains the octet of the equivalent IE defined in TS 23.041 [37, 9.3.2.2.4] and encoded according to TS 23.038 [38].

Conditional presence	Explanation
Segment1	The field is mandatory present in the first segment of SIB11, otherwise it is not present.

6.3.2   Radio resource control information elements

–   *AntennaInfo*

The IE *AntennaInfoCommon* and the *AntennaInfoDedicated* are used to specify the common and the UE specific antenna configuration respectively.

AntennaInfo information elements

```
-- ASN1START

AntennaInfoCommon ::=               SEQUENCE {
    antennaPortsCount                   ENUMERATED {an1, an2, an4, spare1}
}

AntennaInfoDedicated ::=            SEQUENCE {
    transmissionMode                    ENUMERATED {
                                            tm1, tm2, tm3, tm4, tm5, tm6,
                                            tm7, spare1},
    codebookSubsetRestriction           CHOICE {
        n2TxAntenna-tm3                     BIT STRING (SIZE (2)),
        n4TxAntenna-tm3                     BIT STRING (SIZE (4)),
        n2TxAntenna-tm4                     BIT STRING (SIZE (6)),
        n4TxAntenna-tm4                     BIT STRING (SIZE (64)),
        n2TxAntenna-tm5                     BIT STRING (SIZE (4)),
        n4TxAntenna-tm5                     BIT STRING (SIZE (16)),
        n2TxAntenna-tm6                     BIT STRING (SIZE (4)),
        n4TxAntenna-tm6                     BIT STRING (SIZE (16))
    }     OPTIONAL,                                                          -- Cond TM
```

```
    ue-TransmitAntennaSelection         CHOICE{
            release                     NULL,
            setup                       ENUMERATED {closedLoop, openLoop}
    }
}

-- ASN1STOP
```

AntennaInfo field descriptions
antennaPortsCount
Parameter represents the number of cell specific antenna ports where an1 corresponds to 1, an2 to 2 antenna ports etc. see TS 36.211, 6.2.1.
transmissionMode
Points to one of Transmission modes defined in TS 36.213, 7.1 where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.
codebookSubsetRestriction
Parameter: *codebookSubsetRestriction,* see TS 36.213 [23, 7.2] and TS 36.211 [21, 6.3.4.2.3].
ue-TransmitAntennaSelection
For value *setup* the field indicates whether UE transmit antenna selection control is closed-loop or open-loop as described in TS 36.213 [23, 8.7].

Conditional presence	Explanation
TM	The field is mandatory present if the *transmissionMode* is set to tm3, tm4, tm5 or tm6. Otherwise the IE is not present and the UE shall delete any existing value for this field.

–   *CQI-ReportConfig*

The IE *CQI-ReportConfig* is used to specify the CQI reporting configuration.

CQI-ReportConfig information elements

```
-- ASN1START

CQI-ReportConfig ::=                SEQUENCE {
    cqi-ReportModeAperiodic         ENUMERATED {
                                        rm12, rm20, rm22, rm30, rm31,
                                        spare3, spare2, spare1} OPTIONAL,         -- Need OR
    nomPDSCH-RS-EPRE-Offset         INTEGER (-1..6),
    cqi-ReportPeriodic              CQI-ReportPeriodic  OPTIONAL               -- Need ON
}

CQI-ReportPeriodic ::=      CHOICE {
    release                         NULL,
    setup                           SEQUENCE {
        cqi-PUCCH-ResourceIndex             INTEGER (0.. 1185),
        cqi-pmi-ConfigIndex                 INTEGER (0..1023),
        cqi-FormatIndicatorPeriodic         CHOICE {
            widebandCQI                         NULL,
            subbandCQI                          SEQUENCE {
                k                                   INTEGER (1..4)
            }
        },
        ri-ConfigIndex                      INTEGER (0..1023)   OPTIONAL,         -- Need OR
        simultaneousAckNackAndCQI           BOOLEAN
    }
}

-- ASN1STOP
```

CQI-ReportConfig field descriptions
cqi-PUCCH-ResourceIndex
Parameter $n_{\text{PUCCH}}^{(2)}$, see TS 36.213 [23, 7.2].
cqi-pmi-ConfigIndex
Parameter: CQI/PMI Periodicity and Offset Configuration Index $I_{CQI/PMI}$, see TS 36.213 [23, tables 7.2.2-1A and 7.2.2-1C].
ri-ConfigIndex
Parameter: RI Config Index I_{RI}, see TS 36.213 [23, 7.2.2-1B].
K
Parameter: K, see TS 36.213 [23, 7.2.2].
cqi-FormatIndicatorPeriodic
Parameter: *PUCCH CQI Feedback Type, see* TS 36.213 [23, table 7.2.2-1]. Depending on transmissionMode, reporting mode is implicitly given from the table.
simultaneousAckNackAndCQI
Parameter: *Simultaneous-AN-and-CQI.* see TS 36.213 [23, 10.1] TRUE indicates that simultaneous transmission of ACK/NACK and CQI is allowed.
cqi-ReportModeAperiodic
Parameter: *reporting mode.* Value rm12 corresponds to Mode 1-2, rm20 corresponds to Mode 2-0, rm22 corresponds to Mode 2-2 etc. PUSCH reporting modes are described in TS 36.213 [23, 7.2.1].
nomPDSCH-RS-EPRE-Offset
Parameter: Δ_{offset} *see* TS 36.213 [23, 7.2.3]. Actual value = IE value * 2 [dB].

– 	*DRB-Identity*

The IE *DRB-Identity* is used to identify a DRB used by a UE.

DRB-Identity information elements

```
-- ASN1START

DRB-Identity ::=                       INTEGER (1..32)

-- ASN1STOP
```

– 	*LogicalChannelConfig*

The IE *LogicalChannelConfig* is used to configure the logical channel parameters.

LogicalChannelConfig information element

```
-- ASN1START

LogicalChannelConfig ::=              SEQUENCE {
    ul-SpecificParameters                SEQUENCE {
        priority                             INTEGER (1..16),
        prioritisedBitRate                   ENUMERATED {
                                                 kBps0, kBps8, kBps16, kBps32, kBps64, kBps128,
                                                 kBps256, infinity, spare8, spare7, spare6,
                                                 spare5, spare4, spare3, spare2, spare1},
        bucketSizeDuration                   ENUMERATED {
                                                 ms50, ms100, ms150, ms300, ms500, ms1000, spare2,
                                                 spare1},
        logicalChannelGroup                  INTEGER (0..3)          OPTIONAL          -- Need OR
    }        OPTIONAL,                                                                 -- Cond UL
    ...
}

-- ASN1STOP
```

LogicalChannelConfig field descriptions
priority   Logical channel priority in TS 36.321 [6]. Value is an integer.
prioritisedBitRate   Prioritized Bit Rate for logical channel prioritization in TS 36.321 [6]. Value in kilobytes/second. Value kBps0 corresponds to 0 kB/second, kBps8 corresponds to 8 kB/second, kBps16 corresponds to 16 kB/second and so on. Infinity is the only applicable value for SRB1 and SRB2
bucketSizeDuration   Bucket Size Duration for logical channel prioritization in TS 36.321 [6]. Value in milliseconds. Value ms50 corresponds to 50 ms, ms100 corresponds to 100 ms and so on.
logicalChannelGroup   Mapping of logical channel to logical channel group for BSR reporting in TS 36.321 [6].

Conditional presence	Explanation
UL	The field is mandatory present for UL logical channels; otherwise it is not present.

– MAC-MainConfig

The IE *MAC-MainConfig* is used to specify the MAC main configuration for signalling and data radio bearers.

MAC-MainConfig information element

```
-- ASN1START

MAC-MainConfig ::=                   SEQUENCE {
    ul-SCH-Config                        SEQUENCE {
        maxHARQ-Tx                           ENUMERATED {
                                                 n1, n2, n3, n4, n5, n6, n7, n8,
                                                 n10, n12, n16, n20, n24, n28,
                                                 spare2, spare1}    OPTIONAL,    -- Need ON
        periodicBSR-Timer                    ENUMERATED {
                                                 sf5, sf10, sf16, sf20, sf32, sf40, sf64, sf80,
                                                 sf128, sf160, sf320, sf640, sf1280, sf2560,
                                                 infinity, spare1}   OPTIONAL,    -- Need ON
        retxBSR-Timer                        ENUMERATED {
                                                 sf320, sf640, sf1280, sf2560, sf5120,
                                                 sf10240, spare2, spare1},
        ttiBundling                          BOOLEAN
    }                                                                OPTIONAL,    -- Need ON
    drx-Config                           DRX-Config                  OPTIONAL,    -- Need ON
    timeAlignmentTimerDedicated          TimeAlignmentTimer,
    phr-Config                           CHOICE {
        release                              NULL,
        setup                                SEQUENCE {
            periodicPHR-Timer                    ENUMERATED {sf10, sf20, sf50, sf100, sf200,
                                                     sf500, sf1000, infinity},
            prohibitPHR-Timer                    ENUMERATED {sf0, sf10, sf20, sf50, sf100,
                                                       sf200, sf500, sf1000},
            dl-PathlossChange                    ENUMERATED {dB1, dB3, dB6, infinity}
        }
    }                                                                OPTIONAL,    -- Need ON
    ...
}

DRX-Config ::=                       CHOICE {
    release                              NULL,
    setup                                SEQUENCE {
        onDurationTimer                      ENUMERATED {
                                                 psf1, psf2, psf3, psf4, psf5, psf6,
                                                 psf8, psf10, psf20, psf30, psf40,
                                                 psf50, psf60, psf80, psf100,
                                                 psf200},
        drx-InactivityTimer                  ENUMERATED {
                                                 psf1, psf2, psf3, psf4, psf5, psf6,
                                                 psf8, psf10, psf20, psf30, psf40,
                                                 psf50, psf60, psf80, psf100,
                                                 psf200, psf300, psf500, psf750,
                                                 psf1280, psf1920, psf2560, spare10,
                                                 spare9, spare8, spare7, spare6,
                                                 spare5, spare4, spare3, spare2,
                                                 spare1},
```

```
        drx-RetransmissionTimer             ENUMERATED {
                                                psf1, psf2, psf4, psf6, psf8, psf16,
                                                psf24, psf33},
        longDRX-CycleStartOffset        CHOICE {
            sf10                            INTEGER(0..9),
            sf20                            INTEGER(0..19),
            sf32                            INTEGER(0..31),
            sf40                            INTEGER(0..39),
            sf64                            INTEGER(0..63),
            sf80                            INTEGER(0..79),
            sf128                           INTEGER(0..127),
            sf160                           INTEGER(0..159),
            sf256                           INTEGER(0..255),
            sf320                           INTEGER(0..319),
            sf512                           INTEGER(0..511),
            sf640                           INTEGER(0..639),
            sf1024                          INTEGER(0..1023),
            sf1280                          INTEGER(0..1279),
            sf2048                          INTEGER(0..2047),
            sf2560                          INTEGER(0..2559)
        },
        shortDRX                            SEQUENCE {
            shortDRX-Cycle                      ENUMERATED  {
                                                    sf2, sf5, sf8, sf10, sf16, sf20,
                                                    sf32, sf40, sf64, sf80, sf128, sf160,
                                                    sf256, sf320, sf512, sf640},
            drxShortCycleTimer                  INTEGER (1..16)
        }      OPTIONAL                                                     -- Need OR
    }
}

-- ASN1STOP
```

MAC-MainConfig field descriptions
maxHARQ-Tx
Maximum number of transmissions for UL HARQ in TS 36.321 [6].
periodicBSR-Timer
Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on.
retxBSR-Timer
Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf640 corresponds to 640 sub-frames, sf1280 corresponds to 1280 sub-frames and so on.
ttiBundling
TRUE indicates that TTI bundling TS 36.321 [6] is enabled while FALSE indicates that TTI bundling is disabled. TTI bundling can be enabled for FDD and for TDD only for configurations 0, 1 and 6. For TDD, E-UTRAN does not simultaneously enable TTI bundling and semi-persistent scheduling in this release of specification.
longDRX-CycleStartOffset
longDRX-Cycle and *drxStartOffset* in TS 36.321 [6]. The value of l*ongDRX-Cycle* is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. If *shortDRX-Cycle* is configured, the value of *longDRX-Cycle* shall be a multiple of the *shortDRX-Cycle* value. The value of *drxStartOffset* value is in number of sub-frames.
onDurationTimer
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.
drx-InactivityTimer
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.
drx-RetransmissionTimer
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.
shortDRX-Cycle
Short DRX cycle in TS 36.321 [6]. Value in number of sub-frames. Value sf2 corresponds to 2 sub-frames, sf5 corresponds to 5 subframes and so on.
drxShortCycleTimer
Timer for DRX in TS 36.321 [6]. Value in multiples of shortDRX-Cycle. A value of 1 corresponds to shortDRX-Cycle, a value of 2 corresponds to 2 * shortDRX-Cycle and so on.
periodicPHR-Timer
Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 subframes, sf20 corresponds to 20 subframes and so on.
prohibitPHR-Timer
Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf0 corresponds to 0 subframes, sf100 corresponds to 100 subframes and so on.
dl-PathlossChange
DL Pathloss Change for PHR reporting in TS 36.321 [6]. Value in dB. Value dB1 corresponds to 1 dB, dB3 corresponds to 3 dB and so on.

– *PDCP-Config*

The IE *PDCP-Config* is used to set the configurable PDCP parameters for data radio bearers.

PDCP-Config information element

```
-- ASN1START

PDCP-Config ::=                     SEQUENCE {
    discardTimer                        ENUMERATED {
                                            ms50, ms100, ms150, ms300, ms500,
                                            ms750, ms1500, infinity
    }                                                   OPTIONAL,        -- Cond Setup
    rlc-AM                              SEQUENCE {
        statusReportRequired                BOOLEAN
    }                                                   OPTIONAL,        -- Cond Rlc-AM
    rlc-UM                              SEQUENCE {
        pdcp-SN-Size                        ENUMERATED {len7bits, len12bits}
    }                                                   OPTIONAL,        -- Cond Rlc-UM
    headerCompression                   CHOICE {
        notUsed                             NULL,
        rohc                                SEQUENCE {
            maxCID                              INTEGER (1..16383)           DEFAULT 15,
            profiles                            SEQUENCE {
                profile0x0001                       BOOLEAN,
```

```
                    profile0x0002                       BOOLEAN,
                    profile0x0003                       BOOLEAN,
                    profile0x0004                       BOOLEAN,
                    profile0x0006                       BOOLEAN,
                    profile0x0101                       BOOLEAN,
                    profile0x0102                       BOOLEAN,
                    profile0x0103                       BOOLEAN,
                    profile0x0104                       BOOLEAN
             },
             ...
          }
       },
       ...
}

-- ASN1STOP
```

PDCP-Config field descriptions
discardTimer
Indicates the discard timer value specified in TS 36.323 [8]. Value in milliseconds. Value ms50 means 50 ms, ms100 means 100 ms and so on.
statusReportRequired
Indicates whether or not the UE shall send a PDCP Status Report upon re-establishment of the PDCP entity as specified in TS 36.323 [8].
pdcp-SN-Size
Indicates the PDCP Sequence Number length in bits. Value len7bits means that the 7-bit PDCP SN format is used and len12bits means that the 12-bit PDCP SN format is used, as specified in TS 36.323 [8].
maxCID
Indicates the value of the MAX_CID parameter as specified in TS 36.323 [8].
profiles
The profiles used by both compressor and decompressor in both UE and E-UTRAN. The field indicates which of the ROHC profiles specified in TS 36.323 [8] are supported, i.e. value '*true*' indicates that the profile is supported. Profile 0x0000 shall always be supported when the use of ROHC is configured. If support of two ROHC profile identifiers with the same 8 LSB's is signalled, only the profile corresponding to the highest value shall be applied.

Conditional presence	Explanation
Setup	The field is mandatory present in case of radio bearer setup. Otherwise the field is not present.
Rlc-AM	The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC AM. The field is optional, need ON, in case of reconfiguration of a PDCP entity at handover for a radio bearer configured with RLC AM. Otherwise the field is not present.
Rlc-UM	The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC UM. Otherwise the field is not present.

– PDSCH-Config

The IE *PDSCH-ConfigCommon* and the IE *PDSCH-ConfigDedicated* are used to specify the common and the UE specific PDSCH configuration respectively.

PDSCH-Config information element

```
-- ASN1START

PDSCH-ConfigCommon::=         SEQUENCE {
    referenceSignalPower                INTEGER (-60..50),
    p-b                                 INTEGER (0..3)
}

PDSCH-ConfigDedicated::=         SEQUENCE {
    p-a                                 ENUMERATED {
                                         dB-6, dB-4dot77, dB-3, dB-1dot77,
                                         dB0, dB1, dB2, dB3 }
}
```

```
-- ASN1STOP
```

PDSCH-Config field descriptions
referenceSignalPower
Parameter: *Reference-signal power*, which provides the downlink reference-signal EPRE, see TS 36.213 [23, 5.2]. The actual value in dBm.
p-a
Parameter: P_A , see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4dot77 corresponds to -4.77 dB etc.
p-b
Parameter: P_B , see TS 36.213 [23, Table 5.2-1].

– PHICH-Config

The IE *PHICH-Config* is used to specify the PHICH configuration.

PHICH-Config information element

```
-- ASN1START

PHICH-Config ::=                    SEQUENCE {
    phich-Duration                      ENUMERATED {normal, extended},
    phich-Resource                      ENUMERATED {oneSixth, half, one, two}
}

-- ASN1STOP
```

PHICH-Config field descriptions
phich-Duration
Parameter: *PHICH-Duration*, see TS 36.211 [21, Table 6.9.3-1].
phich-Resource
Parameter: *Ng*, see TS 36.211 [21, 6.9]. Value oneSixth corresponds to 1/6, half corresponds to 1/2 and so on.

– PhysicalConfigDedicated

The IE *PhysicalConfigDedicated* is used to specify the UE specific physical channel configuration.

PhysicalConfigDedicated information element

```
-- ASN1START

PhysicalConfigDedicated ::=         SEQUENCE {
    pdsch-ConfigDedicated               PDSCH-ConfigDedicated        OPTIONAL,    -- Need ON
    pucch-ConfigDedicated               PUCCH-ConfigDedicated        OPTIONAL,    -- Need ON
    pusch-ConfigDedicated               PUSCH-ConfigDedicated        OPTIONAL,    -- Need ON
    uplinkPowerControlDedicated         UplinkPowerControlDedicated  OPTIONAL,    -- Need ON
    tpc-PDCCH-ConfigPUCCH               TPC-PDCCH-Config             OPTIONAL,    -- Need ON
    tpc-PDCCH-ConfigPUSCH               TPC-PDCCH-Config             OPTIONAL,    -- Need ON
    cqi-ReportConfig                    CQI-ReportConfig             OPTIONAL,    -- Need ON
    soundingRS-UL-ConfigDedicated       SoundingRS-UL-ConfigDedicated OPTIONAL,   -- Need ON
    antennaInfo                         CHOICE {
        explicitValue                       AntennaInfoDedicated,
        defaultValue                        NULL
    }       OPTIONAL,                                                             -- Need ON
    schedulingRequestConfig             SchedulingRequestConfig      OPTIONAL,    -- Need ON
    ...
}

-- ASN1STOP
```

***PhysicalConfigDedicated* field descriptions**
antennaInfo
A choice is used to indicate whether the *antennaInfo* is signalled explicitly or set to the default antenna configuration as specified in section 9.2.4.
tpc-PDCCH-ConfigPUCCH
PDCCH configuration for power control of PUCCH using format 3/3A, see TS 36.212 [22].
tpc-PDCCH-ConfigPUSCH
PDCCH configuration for power control of PUSCH using format 3/3A, see TS 36.212 [22].

NOTE: During handover, the UE performs a MAC reset, which involves reverting to the default CQI/ SRS/ SR configuration in accordance with subclause 5.3.13 and TS 36.321 [6, 5.9 & 5.2]. Hence, for these parts of the dedicated radio resource configuration, the default configuration (rather than the configuration used in the source cell) is used as the basis for the delta signalling that is included in the message used to perform handover.

– *P-Max*

The IE *P-Max* is used to limit the UE's uplink transmission power on a carrier frequency and is used to calculate the parameter *Pcompensation* defined in TS 36.304 [4]. Corresponds to parameter P_{EMAX} in TS 36.101 [42]. The UE transmit power shall not exceed the minimum of this value (in dBm), if provided, and the maximum UE power for the UE power class, $P_{PowerClass}$, as specified in TS 36.101 [42, 6.2.5].

P-Max information element

```
-- ASN1START

P-Max ::=                   INTEGER (-30..33)

-- ASN1STOP
```

– *PRACH-Config*

The IE *PRACH-ConfigSIB* and IE *PRACH-Config* are used to specify the PRACH configuration in the system information and in the mobility control information, respectively.

PRACH-Config information elements

```
-- ASN1START

PRACH-ConfigSIB ::=         SEQUENCE {
    rootSequenceIndex               INTEGER (0..837),
    prach-ConfigInfo                PRACH-ConfigInfo
}

PRACH-Config ::=            SEQUENCE {
    rootSequenceIndex               INTEGER (0..837),
    prach-ConfigInfo                PRACH-ConfigInfo                        OPTIONAL    -- Need ON
}

PRACH-ConfigInfo ::=            SEQUENCE {
    prach-ConfigIndex               INTEGER (0..63),
    highSpeedFlag                   BOOLEAN,
    zeroCorrelationZoneConfig       INTEGER (0..15),
    prach-FreqOffset                INTEGER (0..94)
}

-- ASN1STOP
```

PRACH-Config field descriptions
rootSequenceIndex Parameter: *RACH_ROOT_SEQUENCE*, see TS 36.211 [21, 5.7.1].
prach-ConfigIndex Parameter: *prach-ConfigurationIndex*, see TS 36.211 [21, 5.7.1].
highSpeedFlag Parameter: High-speed-flag, see TS 36.211, [21, 5.7.2].TRUE corresponds to Restricted set and FALSE to Unrestricted set.
zeroCorrelationZoneConfig Parameter: N_{CS} configuration, see TS 36.211, [21, 5.7.2: table 5.7.2-2] for preamble format 0..3 and TS 36.211, [21, 5.7.2: table 5.7.2-3] for preamble format 4.
prach-FreqOffset Parameter: *prach-FrequencyOffset,* see TS 36.211, [21, 5.7.1]. For TDD the value range is dependent on the value of *prach-ConfigIndex*.

– *PresenceAntennaPort1*

The IE *PresenceAntennaPort1* is used to indicate whether all the neighbouring cells use Antenna Port 1. When set to *TRUE*, the UE may assume that at least two cell-specific antenna ports are used in all neighbouring cells.

PresenceAntennaPort1 information element

```
-- ASN1START

PresenceAntennaPort1 ::=                 BOOLEAN

-- ASN1STOP
```

– *PUCCH-Config*

The IE *PUCCH-ConfigCommon* and IE *PUCCH-ConfigDedicated* are used to specify the common and the UE specific PUCCH configuration respectively.

PUCCH-Config information elements

```
-- ASN1START

PUCCH-ConfigCommon ::=              SEQUENCE {
    deltaPUCCH-Shift                   ENUMERATED {ds1, ds2, ds3},
    nRB-CQI                            INTEGER (0..98),
    nCS-AN                             INTEGER (0..7),
    n1PUCCH-AN                         INTEGER (0..2047)
}

PUCCH-ConfigDedicated ::=          SEQUENCE {
    ackNackRepetition                  CHOICE{
        release                            NULL,
        setup                              SEQUENCE {
            repetitionFactor                   ENUMERATED { n2, n4, n6, spare1},
            n1PUCCH-AN-Rep                     INTEGER (0..2047)
        }
    },
    tdd-AckNackFeedbackMode            ENUMERATED {bundling, multiplexing} OPTIONAL    -- Cond TDD
}

-- ASN1STOP
```

***PUCCH-Config* field descriptions**
deltaPUCCH-Shift   Parameter: $\Delta_{\text{shift}}^{\text{PUCCH}}$, see 36.211, 5.4.1, where ds1 corresponds to value 1 ds2 to 2 etc.
nRB-CQI   Parameter: $N_{\text{RB}}^{(2)}$, see TS 36.211 [21, 5.4].
nCS-An   Parameter: $N_{cs}^{(1)}$ see TS 36.211 [21, 5.4].
n1Pucch-AN   Parameter: $N_{PUCCH}^{(1)}$ see TS 36.213 [23, 10.1].
ackNackRepetition   Parameter indicates whether ACK/NACK repetition is configured, see TS 36.213 [23, 10.1].
repetitionFactor   Parameter N_{ANRep} see TS 36.213 [23, 10.1] where n2 corresponds to repetition factor 2, n4 to 4.
n1Pucch-AN-Rep   Parameter: $n_{\text{PUCCH, ANRep}}^{(1)}$ see TS 36.213 [23, 10.1].
tdd-AckNackFeedbackMode   Parameter indicates one of the two TDD ACK/NACK feedback modes used, see TS 36.213 [23, 7.3]. bundling corresponds to use of ACK/NACK bundling whereas, multiplexing corresponds to ACK/NACK multiplexing. The same value applies to both ACK/NACK feedback modes on PUCCH as well as on PUSCH. For TDD configuration 5, E-UTRAN should always set this field to bundling.

Conditional presence	Explanation
TDD	The field is mandatory present for TDD; it is not present for FDD and the UE shall delete any existing value for this field.

– PUSCH-Config

The IE *PUSCH-ConfigCommon* is used to specify the common PUSCH configuration and the reference signal configuration for PUSCH and PUCCH. The IE *PUSCH-ConfigDedicated* is used to specify the UE specific PUSCH configuration.

PUSCH-Config information element

```
-- ASN1START

PUSCH-ConfigCommon ::=              SEQUENCE {
    pusch-ConfigBasic                  SEQUENCE {
        n-SB                               INTEGER (1..4),
        hoppingMode                        ENUMERATED {interSubFrame, intraAndInterSubFrame},
        pusch-HoppingOffset                INTEGER (0..98),
        enable64QAM                        BOOLEAN
    },
    ul-ReferenceSignalsPUSCH           UL-ReferenceSignalsPUSCH
}

PUSCH-ConfigDedicated ::=          SEQUENCE {
    betaOffset-ACK-Index               INTEGER (0..15),
    betaOffset-RI-Index             INTEGER (0..15),
    betaOffset-CQI-Index               INTEGER (0..15)
}

UL-ReferenceSignalsPUSCH ::=       SEQUENCE {
    groupHoppingEnabled                BOOLEAN,
    groupAssignmentPUSCH               INTEGER (0..29),
    sequenceHoppingEnabled             BOOLEAN,
    cyclicShift                        INTEGER (0..7)
}

-- ASN1STOP
```

PUSCH-Config field descriptions
n-SB
Parameter: N_{sb} see TS 36.211 [21, 5.3.4].
hoppingMode
Parameter: *Hopping-mode*, see TS 36.211 [21, 5.3.4].
pusch-hoppingOffset
Parameter: N_{RB}^{HO}, see TS 36.211 [21, 5.3.4].
enable64QAM
See TS 36.213 [23, 8.6.1]. TRUE indicates that 64QAM is allowed while FALSE indicates that 64QAM is not allowed.
betaOffset-ACK-Index
Parameter: $I_{offset}^{HARQ-ACK}$, see TS 36.213 [23, Table 8.6.3-1].
betaOffset-RI-Index
Parameter: I_{offset}^{RI}, see TS 36.213 [23, Table 8.6.3-2].
betaOffset-CQI-Index
Parameter: I_{offset}^{CQI}, see TS 36.213 [23, Table 8.6.3-3].
ul- ReferenceSignalsPUSCH
Used to specify parameters needed for the transmission on PUSCH (or PUCCH).
groupHoppingEnabled
Parameter: *Group-hopping-enabled*, see TS 36.211 [21, 5.5.1.3].
groupAssignmentPUSCH
Parameter: *ΔSS* See TS 36.211 [21, 5.5.1.3].
sequenceHoppingEnabled
Parameter: *Sequence-hopping-enabled*, see TS 36.211 [21, 5.5.1.4].
cyclicShift
Parameters: *cyclicShift*, *s*ee TS 36.211 [21, Table 5.5.2.1.1-2].

– RACH-ConfigCommon

The IE *RACH-ConfigCommon* is used to specify the generic random access parameters.

RACH-ConfigCommon information element

```
-- ASN1START

RACH-ConfigCommon ::=          SEQUENCE {
    preambleInfo                       SEQUENCE {
        numberOfRA-Preambles                ENUMERATED {
                                                n4, n8, n12, n16 ,n20, n24, n28,
                                                n32, n36, n40, n44, n48, n52, n56,
                                                n60, n64},
        preamblesGroupAConfig               SEQUENCE {
            sizeOfRA-PreamblesGroupA            ENUMERATED {
                                                    n4, n8, n12, n16 ,n20, n24, n28,
                                                    n32, n36, n40, n44, n48, n52, n56,
                                                    n60},
            messageSizeGroupA                   ENUMERATED {b56, b144, b208, b256},
            messagePowerOffsetGroupB            ENUMERATED {
                                                    minusinfinity, dB0, dB5, dB8, dB10, dB12,
                                                    dB15, dB18},
            ...
        }          OPTIONAL                                              -- Need OP
    },
    powerRampingParameters             SEQUENCE {
        powerRampingStep                    ENUMERATED {dB0, dB2,dB4, dB6},
        preambleInitialReceivedTargetPower  ENUMERATED {
                                                dBm-120, dBm-118, dBm-116, dBm-114, dBm-112,
                                                dBm-110, dBm-108, dBm-106, dBm-104, dBm-102,
                                                dBm-100, dBm-98, dBm-96, dBm-94,
                                                dBm-92, dBm-90}
    },
    ra-SupervisionInfo                 SEQUENCE {
        preambleTransMax                    ENUMERATED {
                                                n3, n4, n5, n6, n7, n8, n10, n20, n50,
                                                n100, n200},
        ra-ResponseWindowSize               ENUMERATED {
                                                sf2, sf3, sf4, sf5, sf6, sf7,
                                                sf8, sf10},
```

```
        mac-ContentionResolutionTimer        ENUMERATED {
                                                 sf8, sf16, sf24, sf32, sf40, sf48,
                                                 sf56, sf64}
    },
    maxHARQ-Msg3Tx                     INTEGER (1..8),
    ...
}

-- ASN1STOP
```

RACH-ConfigCommon field descriptions
numberOfRA-Preambles
Number of non-dedicated random access preambles in TS 36.321 [6]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.
preamblesGroupAConfig
Provides the configuration for preamble grouping in TS 36.321 [6]. If the field is not signalled, the size of the random access preambles group A [6] is equal to *numberOfRA-Preambles*.
sizeOfRA-PreamblesGroupA
Size of the random access preambles group A in TS 36.321 [6]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.
messageSizeGroupA
Threshold for preamble selection in TS 36.321 [6]. Value in bits. Value b56 corresponds to 56 bits, b144 corresponds to 144 bits and so on.
messagePowerOffsetGroupB
Threshold for preamble selection in TS 36.321 [6]. Value in dB. Value minusinfinity corresponds to –infinity. Value dB0 corresponds to 0 dB, dB5 corresponds to 5 dB and so on.
powerRampingStep
Power ramping factor in TS 36.321 [6]. Value in dB. Value dB0 corresponds to 0 dB, dB2 corresponds to 2 dB and so on.
preambleInitialReceivedTargetPower
Initial preamble power in TS 36.321 [6]. Value in dBm. Value dBm-120 corresponds to -120 dBm, dBm-118 corresponds to -118 dBm and so on.
preambleTransMax
Maximum number of preamble transmission in TS 36.321 [6]. Value is an integer. Value n3 corresponds to 3, n4 corresponds to 4 and so on.
ra-ResponseWindowSize
Duration of the RA response window in TS 36.321 [6]. Value in subframes. Value sf2 corresponds to 2 subframes, sf3 corresponds to 3 subframes and so on.
mac-ContentionResolutionTimer
Timer for contention resolution in TS 36.321 [6]. Value in subframes. Value sf8 corresponds to 8 subframes, sf16 corresponds to 16 subframes and so on.
maxHARQ-Msg3Tx
Maximum number of Msg3 HARQ transmissions in TS 36.321 [6], used for contention based random access. Value is an integer.

– *RACH-ConfigDedicated*

The IE *RACH-ConfigDedicated* is used to specify the dedicated random access parameters.

RACH-ConfigDedicated information element

```
-- ASN1START

RACH-ConfigDedicated ::=       SEQUENCE {
    ra-PreambleIndex                INTEGER (0..63),
    ra-PRACH-MaskIndex              INTEGER (0..15)
}

-- ASN1STOP
```

RACH-ConfigDedicated field descriptions
ra-PreambleIndex
Explicitly signalled Random Access Preamble for RA Resource selection in TS 36.321 [6].
ra-PRACH-MaskIndex
Explicitly signalled PRACH Mask Index for RA Resource selection in TS 36.321 [6].

– *RadioResourceConfigCommon*

The IE *RadioResourceConfigCommonSIB* and IE *RadioResourceConfigCommon* are used to specify common radio resource configurations in the system information and in the mobility control information, respectively, e.g., the random access parameters and the static physical layer parameters.

RadioResourceConfigCommon information element

```
-- ASN1START

RadioResourceConfigCommonSIB ::=    SEQUENCE {
    rach-ConfigCommon                   RACH-ConfigCommon,
    bcch-Config                         BCCH-Config,
    pcch-Config                         PCCH-Config,
    prach-Config                        PRACH-ConfigSIB,
    pdsch-ConfigCommon                  PDSCH-ConfigCommon,
    pusch-ConfigCommon                  PUSCH-ConfigCommon,
    pucch-ConfigCommon                  PUCCH-ConfigCommon,
    soundingRS-UL-ConfigCommon          SoundingRS-UL-ConfigCommon,
    uplinkPowerControlCommon            UplinkPowerControlCommon,
    ul-CyclicPrefixLength               UL-CyclicPrefixLength,
    ...
}

RadioResourceConfigCommon ::=       SEQUENCE {
    rach-ConfigCommon                   RACH-ConfigCommon              OPTIONAL,    -- Need ON
    prach-Config                        PRACH-Config,
    pdsch-ConfigCommon                  PDSCH-ConfigCommon             OPTIONAL,    -- Need ON
    pusch-ConfigCommon                  PUSCH-ConfigCommon,
    phich-Config                        PHICH-Config                  OPTIONAL,    -- Need ON
    pucch-ConfigCommon                  PUCCH-ConfigCommon            OPTIONAL,    -- Need ON
    soundingRS-UL-ConfigCommon          SoundingRS-UL-ConfigCommon    OPTIONAL,    -- Need ON
    uplinkPowerControlCommon            UplinkPowerControlCommon      OPTIONAL,    -- Need ON
    antennaInfoCommon                   AntennaInfoCommon         OPTIONAL,    -- Need ON
    p-Max                               P-Max                         OPTIONAL,    -- Need OP
    tdd-Config                          TDD-Config                    OPTIONAL,    -- Cond TDD
    ul-CyclicPrefixLength               UL-CyclicPrefixLength,
    ...
}

BCCH-Config ::=                     SEQUENCE {
    modificationPeriodCoeff             ENUMERATED {n2, n4, n8, n16}
}

PCCH-Config ::=                     SEQUENCE {
    defaultPagingCycle                  ENUMERATED {
                                            rf32, rf64, rf128, rf256},
    nB                                  ENUMERATED {
                                            fourT, twoT, oneT, halfT, quarterT, oneEighthT,
                                            oneSixteenthT, oneThirtySecondT}
}

UL-CyclicPrefixLength ::=           ENUMERATED {len1, len2}

-- ASN1STOP
```

RadioResourceConfigCommon field descriptions
p-Max
Pmax to be used in the target cell. If absent the UE applies the maximum power according to the UE capability.
modificationPeriodCoeff
Actual modification period, expressed in number of radio frames= *modificationPeriodCoeff* * *defaultPagingCycle*. n2 corresponds to value 2, n4 corresponds to value 4, n8 corresponds to value 8 and n16 corresponds to value 16.
defaultPagingCycle
Default paging cycle, used to derive 'T' in TS 36.304 [4]. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on.
nB
Parameter: nB is used as one of parameters to derive the Paging Frame and Paging Occasion according to TS 36.304 [4]. Value in multiples of *defaultPagingCycle* ('T'). A value of fourT corresponds to 4 * *defaultPagingCycle*, a value of twoT corresponds to 2 * *defaultPagingCycle* and so on.
UL-CyclicPrefixLength
Parameter: Uplink cyclic prefix length see 36.211 [21, 5.2.1] where len1 corresponds to normal cyclic prefix and len2 corresponds to extended cyclic prefix.

Conditional presence	Explanation
TDD	The field is optional for TDD, Need ON; it is not present for FDD and the UE shall delete any existing value for this field.

– *RadioResourceConfigDedicated*

The IE *RadioResourceConfigDedicated* is used to setup/modify/release RBs, to modify the MAC main configuration, to modify the SPS configuration and to modify dedicated physical configuration.

RadioResourceConfigDedicated information element

```
-- ASN1START

RadioResourceConfigDedicated ::=          SEQUENCE {
    srb-ToAddModList                      SRB-ToAddModList          OPTIONAL,    -- Cond HO-Conn
    drb-ToAddModList                      DRB-ToAddModList          OPTIONAL,    -- Cond HO-
toEUTRA
    drb-ToReleaseList                     DRB-ToReleaseList         OPTIONAL,    -- Need ON
    mac-MainConfig                        CHOICE {
            explicitValue                 MAC-MainConfig,
            defaultValue                  NULL
    }       OPTIONAL,                                                           -- Cond HO-
toEUTRA2
    sps-Config                            SPS-Config                OPTIONAL,    -- Need ON
    physicalConfigDedicated               PhysicalConfigDedicated   OPTIONAL,    -- Need ON
    ...
}

SRB-ToAddModList ::=              SEQUENCE (SIZE (1..2)) OF SRB-ToAddMod

SRB-ToAddMod ::=     SEQUENCE {
    srb-Identity                     INTEGER (1..2),
    rlc-Config                       CHOICE {
        explicitValue                RLC-Config,
        defaultValue                 NULL
    }       OPTIONAL,                                                           -- Cond Setup
    logicalChannelConfig             CHOICE {
        explicitValue                LogicalChannelConfig,
        defaultValue                 NULL
    }       OPTIONAL,                                                           -- Cond Setup
    ...
}

DRB-ToAddModList ::=              SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod

DRB-ToAddMod ::=     SEQUENCE {
    eps-BearerIdentity               INTEGER (0..15)          OPTIONAL,    -- Cond DRB-Setup
    drb-Identity                     DRB-Identity,
    pdcp-Config                      PDCP-Config              OPTIONAL,    -- Cond PDCP
    rlc-Config                       RLC-Config               OPTIONAL,    -- Cond Setup
    logicalChannelIdentity           INTEGER (3..10)          OPTIONAL,    -- Cond DRB-Setup
    logicalChannelConfig             LogicalChannelConfig     OPTIONAL,    -- Cond Setup
    ...
```

```
}

DRB-ToReleaseList ::=                    SEQUENCE (SIZE (1..maxDRB)) OF DRB-Identity

-- ASN1STOP
```

RadioResourceConfigDedicated field descriptions
srb-Identity Value 1 is applicable for SRB1 only. Value 2 is applicable for SRB2 only.
rlc-Config For SRBs a choice is used to indicate whether the RLC configuration is signalled explicitly or set to the values defined in the default RLC configuration for SRB1 in 9.2.1.1 or for SRB2 in 9.2.1.2. RLC AM is the only applicable RLC mode for SRB1 and SRB2. E-UTRAN does not reconfigure the RLC mode of DRBs, and may reconfigure the UM RLC SN field size only upon handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment.
mac-MainConfig Although the ASN.1 includes a choice that is used to indicate whether the mac-MainConfig is signalled explicitly or set to the default MAC main configuration as specified in 9.2.2, EUTRAN does not apply "*defaultValue*".
sps-Config The default SPS configuration is specified in 9.2.3. Except for handover or releasing SPS, E-UTRAN does not reconfigure *sps-Config* when there is a configured downlink assignment or a configured uplink grant (see 36.321 [6]).
physicalConfigDedicated The default dedicated physical configuration is specified in 9.2.4.
logicalChannelConfig For SRBs a choice is used to indicate whether the logical channel configuration is signalled explicitly or set to the default logical channel configuration for SRB1 as specified in 9.2.1.1 or for SRB2 as specified in 9.2.1.2.
logicalChannelIdentity The logical channel identity for both UL and DL.

Conditional presence	**Explanation**
DRB-Setup	The field is mandatory present if the corresponding DRB is being set up (including bearer setup at handover to E-UTRA); otherwise it is not present.
PDCP	The field is mandatory present if the corresponding DRB is being setup; the field is optionally present, need ON, upon handover within E-UTRA and upon the first reconfiguration after re-establishment; otherwise it is not present.
Setup	The field is mandatory present if the corresponding SRB/DRB is being setup; otherwise the field is optionally present, need ON.
HO-Conn	The field is mandatory present in case of handover to E-UTRA and to only establish SRB1 in case of RRC connection establishment; otherwise the field is optionally present, need ON.
HO-toEUTRA	The field is mandatory present in case of handover to E-UTRA; In case of RRC connection establishment and RRC connection re-establishment the field is not present; otherwise the field is optionally present, need ON.
HO-toEUTRA2	The field is mandatory present in case of handover to E-UTRA; otherwise the field is optionally present, need ON.

– RLC-Config

The IE *RLC-Config* is used to specify the RLC configuration of SRBs and DRBs.

RLC-Config information element

```
-- ASN1START

RLC-Config ::=               CHOICE {
    am                              SEQUENCE {
        ul-AM-RLC                       UL-AM-RLC,
        dl-AM-RLC                       DL-AM-RLC
    },
    um-Bi-Directional               SEQUENCE {
        ul-UM-RLC                       UL-UM-RLC,
        dl-UM-RLC                       DL-UM-RLC
    },
    um-Uni-Directional-UL           SEQUENCE {
        ul-UM-RLC                       UL-UM-RLC
    },
```

```
    um-Uni-Directional-DL               SEQUENCE {
        dl-UM-RLC                           DL-UM-RLC
    },
    ...
}

UL-AM-RLC ::=                        SEQUENCE {
    t-PollRetransmit                    T-PollRetransmit,
    pollPDU                             PollPDU,
    pollByte                            PollByte,
    maxRetxThreshold                    ENUMERATED {
                                            t1, t2, t3, t4, t6, t8, t16, t32}
}

DL-AM-RLC ::=                        SEQUENCE {
    t-Reordering                        T-Reordering,
    t-StatusProhibit                    T-StatusProhibit
}

UL-UM-RLC ::=                        SEQUENCE {
    sn-FieldLength                      SN-FieldLength
}

DL-UM-RLC ::=                        SEQUENCE {
    sn-FieldLength                      SN-FieldLength,
    t-Reordering                        T-Reordering
}

SN-FieldLength ::=                   ENUMERATED {size5, size10}

T-PollRetransmit ::=                 ENUMERATED {
                                        ms5, ms10, ms15, ms20, ms25, ms30, ms35,
                                        ms40, ms45, ms50, ms55, ms60, ms65, ms70,
                                        ms75, ms80, ms85, ms90, ms95, ms100, ms105,
                                        ms110, ms115, ms120, ms125, ms130, ms135,
                                        ms140, ms145, ms150, ms155, ms160, ms165,
                                        ms170, ms175, ms180, ms185, ms190, ms195,
                                        ms200, ms205, ms210, ms215, ms220, ms225,
                                        ms230, ms235, ms240, ms245, ms250, ms300,
                                        ms350, ms400, ms450, ms500, spare9, spare8,
                                        spare7, spare6, spare5, spare4, spare3,
                                        spare2, spare1}

PollPDU ::=                          ENUMERATED {
                                        p4, p8, p16, p32, p64, p128, p256, pInfinity}

PollByte ::=                         ENUMERATED {
                                        kB25, kB50, kB75, kB100, kB125, kB250, kB375,
                                        kB500, kB750, kB1000, kB1250, kB1500, kB2000,
                                        kB3000, kBinfinity, spare1}

T-Reordering ::=                     ENUMERATED {
                                        ms0, ms5, ms10, ms15, ms20, ms25, ms30, ms35,
                                        ms40, ms45, ms50, ms55, ms60, ms65, ms70,
                                        ms75, ms80, ms85, ms90, ms95, ms100, ms110,
                                        ms120, ms130, ms140, ms150, ms160, ms170,
                                        ms180, ms190, ms200, spare1}

T-StatusProhibit ::=                 ENUMERATED {
                                        ms0, ms5, ms10, ms15, ms20, ms25, ms30, ms35,
                                        ms40, ms45, ms50, ms55, ms60, ms65, ms70,
                                        ms75, ms80, ms85, ms90, ms95, ms100, ms105,
                                        ms110, ms115, ms120, ms125, ms130, ms135,
                                        ms140, ms145, ms150, ms155, ms160, ms165,
                                        ms170, ms175, ms180, ms185, ms190, ms195,
                                        ms200, ms205, ms210, ms215, ms220, ms225,
                                        ms230, ms235, ms240, ms245, ms250, ms300,
                                        ms350, ms400, ms450, ms500, spare8, spare7,
                                        spare6, spare5, spare4, spare3, spare2,
                                        spare1}

-- ASN1STOP
```

***RLC-Config* field descriptions**
sn-FieldLength
Indicates the UM RLC SN field size, see TS 36.322 [7], in bits. Value size5 means 5 bits, size10 means 10 bits.
t-PollRetransmit
Timer for RLC AM in TS 36.322 [7], in milliseconds. Value ms5 means 5ms, ms10 means 10ms and so on.
pollPDU
Parameter for RLC AM in TS 36.322 [7]. Value p4 corresponds to 4 PDUs, p8 to 8 PDUs and so on. pInfinity corresponds to an infinite number of PDUs.
pollByte
Parameter for RLC AM in TS 36.322 [7]. Value kB25 corresponds to 25 kBytes, kB50 to 50 kBytes and so on. kBInfinity corresponds to an infinite amount of kBytes.
maxRetxThreshold
Parameter for RLC AM in TS 36.322 [7]. Value t1 corresponds to 1 retransmission, t2 to 2 retransmissions and so on.
t-Reordering
Timer for reordering in TS 36.322 [7], in milliseconds. Value ms0 means 0ms, ms5 means 5ms and so on.
t-StatusProhibit
Timer for status reporting in TS 36.322 [7], in milliseconds. Value ms0 means 0ms, ms5 means 5ms and so on.

– *SchedulingRequestConfig*

The IE *SchedulingRequestConfig* is used to specify the Scheduling Request related parameters

***SchedulingRequestConfig* information element**

```
-- ASN1START

SchedulingRequestConfig ::=       CHOICE {
    release                           NULL,
    setup                             SEQUENCE {
        sr-PUCCH-ResourceIndex            INTEGER (0..2047),
        sr-ConfigIndex                    INTEGER (0..155),
        dsr-TransMax                      ENUMERATED {
                                              n4, n8, n16, n32, n64, spare3, spare2, spare1}
    }
}

-- ASN1STOP
```

***SchedulingRequestConfig* field descriptions**
sr-PUCCH-ResourceIndex
Parameter: $n_{\mathrm{PUCCH,SRI}}^{(1)}$. see TS 36.213 [23, 10.1].
sr-ConfigIndex
Parameter I_{SR}. See TS 36.213 [23,10.1].
dsr-TransMax
Parameter for SR transmission in TS 36.321 [6, 5.4.4]. The value n4 corresponds to 4 transmissions, n8 corresponds to 8 transmissions and so on.

– *SoundingRS-UL-Config*

The IE *SoundingRS-UL-Config* is used to specify the uplink Sounding RS configuration.

***SoundingRS-UL-Config* information element**

```
-- ASN1START

SoundingRS-UL-ConfigCommon ::=       CHOICE {
    release                              NULL,
    setup                                SEQUENCE {
        srs-BandwidthConfig                  ENUMERATED {bw0, bw1, bw2, bw3, bw4, bw5, bw6, bw7},
        srs-SubframeConfig                   ENUMERATED {
                                                 sc0, sc1, sc2, sc3, sc4, sc5, sc6, sc7,
                                                 sc8, sc9, sc10, sc11, sc12, sc13, sc14, sc15},
        ackNackSRS-SimultaneousTransmission BOOLEAN,
        srs-MaxUpPts                         ENUMERATED {true}          OPTIONAL    -- Cond TDD
```

```
        }
}

SoundingRS-UL-ConfigDedicated ::=    CHOICE{
    release                              NULL,
    setup                                SEQUENCE {
        srs-Bandwidth                        ENUMERATED {bw0, bw1, bw2, bw3},
        srs-HoppingBandwidth                 ENUMERATED {hbw0, hbw1, hbw2, hbw3},
        freqDomainPosition                   INTEGER (0..23),
        duration                             BOOLEAN,
        srs-ConfigIndex                      INTEGER (0..1023),
        transmissionComb                     INTEGER (0..1),
        cyclicShift                          ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
    }
}


-- ASN1STOP
```

SoundingRS-UL-Config field descriptions
srs-BandwidthConfig
Parameter: SRS Bandwidth Configuration. See TS 36.211, [21, table 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2– 4]. Actual configuration depends on UL bandwidth. bw0 corresponds to value 0, bw1 to value 1 and so on.
srs-SubframeConfig
Parameter: SRS SubframeConfiguration. See TS 36.211, [21, table 5.5.3.3-1] applies for FDD whereas TS 36.211, [21, table 5.5.3.3-2] applies for TDD. sc0 corresponds to value 0, sc1 to value 1 and so on.
ackNackSRS-SimultaneousTransmission
Parameter: *Simultaneous-AN-and-SRS*, see TS 36.213 [23, 8.2].
srs-Bandwidth
Parameter: B_{SRS}, see TS 36.211 [21, tables 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2-4].
freqDomainPosition
Parameter: n_{RRC}, see TS 36.211 [21, 5.5.3.2].
srs-HoppingBandwidth
Parameter: SRS hopping bandwidth $b_{hop} \in \{0,1,2,3\}$, see TS 36.211 [21, 5.5.3.2] where hbw0 corresponds to value 0, hbw1 to value 1 and so on.
duration
Parameter: Duration. See TS 36.213 [21, 8.2]. FALSE corresponds to "single" and value TRUE to "indefinite".
srs-ConfigIndex
Parameter: I_SRS. See TS 36.213 [23, table8.2-1].
transmissionComb
Parameter: $k_{\text{TC}} \in \{0,1\}$, see TS 36.211 [21, 5.5.3.2].
cyclicShift
Parameter: n_SRS. See TS 36.211 [21, 5.5.3.1], where cs0 corresponds to 0 etc.
srs-MaxUpPts
Parameter: srsMaxUpPts, see TS 36.211 [21, 5.5.3.2]. If this field is present, reconfiguration of $m_{\text{SRS},0}^{\max}$ applies for UpPts, otherwise reconfiguration does not apply.

Conditional presence	Explanation
TDD	This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.

– *SPS-Config*

The IE *SPS-Config* is used to specify the semi-persistent scheduling configuration.

SPS-Config information element

```
-- ASN1START

SPS-Config ::=  SEQUENCE {
    semiPersistSchedC-RNTI           C-RNTI                 OPTIONAL,        -- Need OR
    sps-ConfigDL                     SPS-ConfigDL           OPTIONAL,        -- Need ON
    sps-ConfigUL                     SPS-ConfigUL           OPTIONAL         -- Need ON
```

```
}

SPS-ConfigDL ::=    CHOICE{
    release                              NULL,
    setup                                SEQUENCE {
        semiPersistSchedIntervalDL           ENUMERATED {
                                                 sf10, sf20, sf32, sf40, sf64, sf80,
                                                 sf128, sf160, sf320, sf640, spare6,
                                                 spare5, spare4, spare3, spare2,
                                                 spare1},
        numberOfConfSPS-Processes            INTEGER (1..8),
        n1-PUCCH-AN-PersistentList           N1-PUCCH-AN-PersistentList,
        ...
    }
}

SPS-ConfigUL ::=    CHOICE {
    release                              NULL,
    setup                                SEQUENCE {
        semiPersistSchedIntervalUL           ENUMERATED {
                                                 sf10, sf20, sf32, sf40, sf64, sf80,
                                                 sf128, sf160, sf320, sf640, spare6,
                                                 spare5, spare4, spare3, spare2,
                                                 spare1},
        implicitReleaseAfter                 ENUMERATED {e2, e3, e4, e8},
        p0-Persistent                        SEQUENCE {
            p0-NominalPUSCH-Persistent           INTEGER (-126..24),
            p0-UE-PUSCH-Persistent               INTEGER (-8..7)
        }      OPTIONAL,                                    -- Need OP
        twoIntervalsConfig                   ENUMERATED {true}        OPTIONAL,   -- Cond TDD
        ...
    }
}

N1-PUCCH-AN-PersistentList ::=      SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)

-- ASN1STOP
```

***SPS-Config* field descriptions**
semiPersistSchedC-RNTI
Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].
semiPersistSchedIntervalDL
Semi-persistent scheduling interval in downlink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames. In this release, sf32, sf64 and sf128 should not be configured in TDD.
numberOfConfSPS-Processes
Parameter: *Number of Configured SPS Processes,* see TS 36.321 [6].
n1-PUCCH-AN-PersistentList
List of parameter: $n_{PUCCH}^{(1)}$ see TS 36.213, [23, 10.1].
semiPersistSchedIntervalUL
Semi-persistent scheduling interval in uplink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames. In this release, sf32, sf64 and sf128 should not be configured in TDD.
implicitReleaseAfter
Number of empty transmissions before implicit release, see TS 36.321 [6, 5.10.2]. Value e2 corresponds to 2 transmissions, e3 corresponds to 3 transmissions and so on.
p0-NominalPUSCH-Persistent
Parameter: $P_{O\_NOMINAL\_PUSCH}(0)$. See TS 36.213 [23, 5.1.1.1], unit dBm step 1. This field is applicable for persistent scheduling, only. If choice 'setup' is used and *p0-Persistent* is absent, apply the value of *p0-NominalPUSCH* for *p0-NominalPUSCH-Persistent*.
p0-UE-PUSCH-Persistent
Parameter: $P_{O\_UE\_PUSCH}(0)$. See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for persistent scheduling, only. If choice 'setup' is used and *p0-Persistent* is absent, apply the value of p0-UE-PUSCH for *p0-UE-PUSCH-Persistent*.
twoIntervalsConfig
Trigger of two-intervals-Semi-Persistent Scheduling in uplink. See TS 36.321 [6, 5.10]. If this field is present, two-intervals-SPS is enabled for uplink. Otherwise, two-intervals-SPS is disabled.

Conditional presence	**Explanation**
TDD	This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.

–   *TDD-Config*

The IE *TDD-Config* is used to specify the TDD specific physical channel configuration.

TDD-Config information element

```
-- ASN1START

TDD-Config ::=                          SEQUENCE {
    subframeAssignment                      ENUMERATED {
                                                sa0, sa1, sa2, sa3, sa4, sa5, sa6},
    specialSubframePatterns                 ENUMERATED {
                                                ssp0, ssp1, ssp2, ssp3, ssp4,ssp5, ssp6, ssp7,
                                                ssp8}
}

-- ASN1STOP
```

***TDD-Config* field descriptions**
subframeAssignment Indicates DL/UL subframe configuration where sa0 point to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2.2].
specialSubframePatterns Indicates Configuration as in TS 36.211 [21, table 4.2.1] where ssp0 point to Configuration 0, ssp1 to Configuration 1 etc.

– *TimeAlignmentTimer*

The IE *TimeAlignmentTimer* is used to control how long the UE is considered uplink time aligned. Corresponds to the Timer for time alignment in TS 36.321 [6]. Value in number of sub-frames. Value sf500 corresponds to 500 sub-frames, sf750 corresponds to 750 sub-frames and so on.

TimeAlignmentTimer information element

```
-- ASN1START

TimeAlignmentTimer ::=                   ENUMERATED {
                                            sf500, sf750, sf1280, sf1920, sf2560, sf5120,
                                            sf10240, infinity}
-- ASN1STOP
```

– *TPC-PDCCH-Config*

The IE *TPC-PDCCH-Config* is used to specify the RNTIs and indexes for PUCCH and PUSCH power control according to TS 36.212 [22]. The power control function can either be setup or released with the IE.

TPC-PDCCH-Config information element

```
-- ASN1START

TPC-PDCCH-Config::=                   CHOICE {
    release                             NULL,
    setup                               SEQUENCE {
        tpc-RNTI                            BIT STRING (SIZE (16)),
        tpc-Index                           TPC-Index
    }
}

TPC-Index ::=                         CHOICE {
    indexOfFormat3                      INTEGER (1..15),
    indexOfFormat3A                     INTEGER (1..31)
}

-- ASN1STOP
```

***TPC-PDCCH-Config* field descriptions**
tpc-RNTI RNTI for power control using DCI format 3/3A, see TS 36.212 [22].
tpc-Index Index of N or M, see TS 36.212 [22, 5.3.3.1.6 and 5.3.3.1.7], where N or M is dependent on the used DCI format (i.e. format 3 or 3a).
indexOfFormat3 Index of N when DCI format 3 is used. See TS 36.212 [22, 5.3.3.1.6].
IndexOfFormat3A Index of M when DCI format 3A is used. See TS 36.212 [22, 5.3.3.1.7].

– UplinkPowerControl

The IE *UplinkPowerControlCommon* and IE *UplinkPowerControlDedicated* are used to specify parameters for uplink power control in the system information and in the dedicated signalling, respectively.

UplinkPowerControl information elements

```
-- ASN1START

UplinkPowerControlCommon ::=        SEQUENCE {
    p0-NominalPUSCH                     INTEGER (-126..24),
    alpha                               ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1},
    p0-NominalPUCCH                     INTEGER (-127..-96),
    deltaFList-PUCCH                    DeltaFList-PUCCH,
    deltaPreambleMsg3                   INTEGER (-1..6)
}

UplinkPowerControlDedicated ::=     SEQUENCE {
    p0-UE-PUSCH                         INTEGER (-8..7),
    deltaMCS-Enabled                    ENUMERATED {en0, en1},
    accumulationEnabled                 BOOLEAN,
    p0-UE-PUCCH                         INTEGER (-8..7),
    pSRS-Offset                         INTEGER (0..15),
    filterCoefficient                   FilterCoefficient            DEFAULT fc4
}

DeltaFList-PUCCH ::=                SEQUENCE {
    deltaF-PUCCH-Format1                ENUMERATED {deltaF-2, deltaF0, deltaF2},
    deltaF-PUCCH-Format1b               ENUMERATED {deltaF1, deltaF3, deltaF5},
    deltaF-PUCCH-Format2               ENUMERATED {deltaF-2, deltaF0, deltaF1, deltaF2},
    deltaF-PUCCH-Format2a              ENUMERATED {deltaF-2, deltaF0, deltaF2},
    deltaF-PUCCH-Format2b              ENUMERATED {deltaF-2, deltaF0, deltaF2}
}

-- ASN1STOP
```

UplinkPowerControl field descriptions
p0-NominalPUSCH
Parameter: $P_{\text{O\_NOMINAL\_PUSCH}}(1)$ See TS 36.213, 5.1.1.1, unit dBm. This field is applicable for non-persistent scheduling, only.
alpha
Parameter: α See TS 36.213, 5.1.1.1 where al0 corresponds to 0, al04 corresponds to value 0.4, al05 to 0.5, al06 to 0.6, al07 to 0.7, al08 to 0.8, al09 to 0.9 and al1 corresponds to 1.
p0-NominalPUCCH
Parameter: $P_{\text{O\_NOMINAL\_PUCCH}}$ See TS 36.213, 5.1.2.1, unit dBm.
deltaF-PUCCH-FormatX
Parameter: $\Delta_{\text{F\_PUCCH}}(F)$ for the PUCCH formats 1, 1b, 2, 2a and 2b. See TS 36.213 [23, 5.1.2] where deltaF-2 corresponds to -2 dB, deltaF0 corresponds to 0 dB and so on.
p0-UE-PUSCH
Parameter: $P_{\text{O\_UE\_PUSCH}}(1)$ See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for non-persistent scheduling, only.
deltaPreambleMsg3
Parameter: $\Delta_{PREAMBLE\_Msg3}$ see TS 36.213 [23, 5.1.1.1]. Actual value = IE value * 2 [dB].
deltaMCS-Enabled
Parameter: Ks See TS 36.213 [23, 5.1.1.1]. en0 corresponds to value 0 corresponding to state "disabled". en1 corresponds to value 1.25 corresponding to "enabled".
accumulationEnabled
Parameter: Accumulation-enabled, see TS 36.213 [23, 5.1.1.1]. TRUE corresponds to "enabled" whereas FALSE corresponds to "disabled".
p0-UE-PUCCH
Parameter: $P_{\text{O\_UE\_PUCCH}}$ See TS 36.213 [23, 5.1.2.1]. Unit dB
pSRS-Offset
Parameter: P_{SRS_OFFSET} See TS 36.213 [23, 5.1.3.1]. For Ks=1.25, the actual parameter value is pSRS-Offset value – 3. For Ks=0, the actual parameter value is -10.5 + 1.5*pSRS-Offset value.
filterCoefficient
Specifies the filtering coefficient for RSRP measurements used to calculate path loss, as specified in TS 36.213 [23, 5.1.1.1]. The same filtering mechanism applies as for *quantityConfig* described in 5.5.3.2.

6.3.3 Security control information elements

– *NextHopChainingCount*

The IE *NextHopChainingCount* is used to update the K_{eNB} key and corresponds to parameter NCC: See TS 33.401 [32, 7.2.8.4].

NextHopChainingCount information element

```
-- ASN1START

NextHopChainingCount ::=                     INTEGER (0..7)

-- ASN1STOP
```

– *SecurityAlgorithmConfig*

The IE *SecurityAlgorithmConfig* is used to configure AS integrity protection algorithm (SRBs) and AS ciphering algorithm (SRBs and DRBs).

SecurityAlgorithmConfig information element

```
-- ASN1START

SecurityAlgorithmConfig ::=          SEQUENCE {
    cipheringAlgorithm                   ENUMERATED {
                                             eea0, eea1, eea2, spare5, spare4, spare3,
                                             spare2, spare1, ...},
    integrityProtAlgorithm               ENUMERATED {
                                             reserved, eia1, eia2, spare5, spare4, spare3,
                                             spare2, spare1, ...}
}

-- ASN1STOP
```

SecurityAlgorithmConfig field descriptions
integrityProtAlgorithm Indicates the integrity protection algorithm to be used for SRBs, as specified in TS 33.401 [32, 5.1.4.2]. The value '*reserved*' is handled as a spare value in Rel-8.
cipheringAlgorithm Indicates the ciphering algorithm to be used for SRBs and DRBs, as specified in TS 33.401 [32, 5.1.3.2].

– *ShortMAC-I*

The IE *ShortMAC-I* is used to identify and verify the UE at RRC connection re-establishment. The 16 least significant bits of the MAC-I calculated using the security configuration of the source cell, as specified in 5.3.7.4.

ShortMAC-I information element

```
-- ASN1START

ShortMAC-I ::=                        BIT STRING (SIZE (16))

-- ASN1STOP
```

6.3.4 Mobility control information elements

– *AdditionalSpectrumEmission*

The UE requirements related to IE *AdditionalSpectrumEmission* are defined in TS 36.101 [42, table 6.2.4-1].

AdditionalSpectrumEmission information element

```
-- ASN1START

AdditionalSpectrumEmission ::=      INTEGER (1..32)

-- ASN1STOP
```

– ARFCN-ValueCDMA2000

The IE *ARFCN-ValueCDMA2000* used to indicate the CDMA2000 carrier frequency within a CDMA2000 band, see C.S0002-A [12].

ARFCN-ValueCDMA2000 information element

```
-- ASN1START

ARFCN-ValueCDMA2000 ::=       INTEGER (0..2047)

-- ASN1STOP
```

– ARFCN-ValueEUTRA

The IE *ARFCN-ValueEUTRA* is used to indicate the ARFCN applicable for a downlink, uplink or bi-directional (TDD) E-UTRA carrier frequency, as defined in TS 36.101 [42].

ARFCN-ValueEUTRA information element

```
-- ASN1START

ARFCN-ValueEUTRA ::=              INTEGER (0..maxEARFCN)

-- ASN1STOP
```

– ARFCN-ValueGERAN

The IE *ARFCN-ValueGERAN* is used to specify the ARFCN value applicable for a GERAN BCCH carrier frequency, see TS 45.005 [20].

ARFCN-ValueGERAN information element

```
-- ASN1START

ARFCN-ValueGERAN ::=            INTEGER (0..1023)

-- ASN1STOP
```

– ARFCN-ValueUTRA

The IE *ARFCN-ValueUTRA* is used to indicate the ARFCN applicable for a downlink (Nd, FDD) or bi-directional (Nt, TDD) UTRA carrier frequency, as defined in TS 25.331 [19].

ARFCN-ValueUTRA information element

```
-- ASN1START

ARFCN-ValueUTRA ::=              INTEGER (0..16383)

-- ASN1STOP
```

– *BandclassCDMA2000*

The IE *BandclassCDMA2000* is used to define the CDMA2000 band in which the CDMA2000 carrier frequency can be found, as defined in C.S0057-B [24, table 1.5-1].

BandclassCDMA2000 information element

```
-- ASN1START

BandclassCDMA2000 ::=                        ENUMERATED {
                                             bc0, bc1, bc2, bc3, bc4, bc5, bc6, bc7, bc8,
                                             bc9, bc10, bc11, bc12, bc13, bc14, bc15, bc16,
                                             bc17, spare14, spare13, spare12, spare11, spare10,
                                             spare9, spare8, spare7, spare6, spare5, spare4,
                                             spare3, spare2, spare1, ...}

-- ASN1STOP
```

– *BandIndicatorGERAN*

The IE *BandIndicatorGERAN* indicates how to interpret an associated GERAN carrier ARFCN, see TS 45.005 [20]. More specifically, the IE indicates the GERAN frequency band in case the ARFCN value can concern either a DCS 1800 or a PCS 1900 carrier frequency. For ARFCN values not associated with one of these bands, the indicator has no meaning.

BandIndicatorGERAN information element

```
-- ASN1START

BandIndicatorGERAN ::=          ENUMERATED {dcs1800, pcs1900}

-- ASN1STOP
```

– *CarrierFreqCDMA2000*

The IE *CarrierFreqCDMA2000* used to provide the CDMA2000 carrier information.

CarrierFreqCDMA2000 information element

```
-- ASN1START

CarrierFreqCDMA2000 ::=          SEQUENCE {
    bandClass                        BandclassCDMA2000,
    arfcn                            ARFCN-ValueCDMA2000
}

-- ASN1STOP
```

– *CarrierFreqGERAN*

The IE *CarrierFreqGERAN* is used to provide an unambiguous carrier frequency description of a GERAN cell.

CarrierFreqGERAN information element

```
-- ASN1START

CarrierFreqGERAN ::=              SEQUENCE {
    arfcn                            ARFCN-ValueGERAN,
    bandIndicator                    BandIndicatorGERAN
}

-- ASN1STOP
```

CarrierFreqGERAN field descriptions
arfcn
GERAN ARFCN of BCCH carrier.
bandIndicator
Indicates how to interpret the ARFCN of the BCCH carrier.

–   *CarrierFreqsGERAN*

The IE *CarrierFreqListGERAN* is used to provide one or more GERAN ARFCN values, as defined in TS 44.005 [43], which represents a list of GERAN BCCH carrier frequencies.

CarrierFreqsGERAN information element

```
-- ASN1START

CarrierFreqsGERAN ::=              SEQUENCE {
    startingARFCN                      ARFCN-ValueGERAN,
    bandIndicator                     BandIndicatorGERAN,
    followingARFCNs                   CHOICE {
        explicitListOfARFCNs              ExplicitListOfARFCNs,
        equallySpacedARFCNs               SEQUENCE {
            arfcn-Spacing                     INTEGER (1..8),
            numberOfFollowingARFCNs           INTEGER (0..31)
        },
        variableBitMapOfARFCNs            OCTET STRING (SIZE (1..16))
    }
}

ExplicitListOfARFCNs ::=          SEQUENCE (SIZE (0..31)) OF ARFCN-ValueGERAN

-- ASN1STOP
```

CarrierFreqsGERAN field descriptions
startingARFCN
The first ARFCN value, s, in the set.
bandIndicator
Indicates how to interpret the ARFCN of the BCCH carrier.
followingARFCNs
Field containing a representation of the remaining ARFCN values in the set.
explicitListOfARFCNs
The remaining ARFCN values in the set are explicitly listed one by one.
arfcn-Spacing
Space, d, between a set of equally spaced ARFCN values.
numberOfFollowingARFCNs
The number, n, of the remaining equally spaced ARFCN values in the set. The complete set of (n+1) ARFCN values is defined as: {s, ((s + d) mod 1024), ((s + 2*d) mod 1024) ... ((s + n*d) mod 1024)}.
variableBitMapOfARFCNs
Bitmap field representing the remaining ARFCN values in the set. The leading bit of the first octet in the bitmap corresponds to the ARFCN = ((s + 1) mod 1024), the next bit to the ARFCN = ((s + 2) mod 1024), and so on. If the bitmap consist of N octets, the trailing bit of octet N corresponds to ARFCN = ((s + 8*N) mod 1024). The complete set of ARFCN values consists of ARFCN = s and the ARFCN values, where the corresponding bit in the bitmap is set to "1".

–   *CDMA2000-Type*

The IE *CDMA2000-Type* is used to describe the type of CDMA2000 network.

CDMA2000-Type information element

```
-- ASN1START

CDMA2000-Type ::=                 ENUMERATED {type1XRTT, typeHRPD}

-- ASN1STOP
```

– *CellIdentity*

The IE *CellIdentity* is used to unambiguously identify a cell within a PLMN.

CellIdentity information element

```
-- ASN1START

CellIdentity ::=                    BIT STRING (SIZE (28))

-- ASN1STOP
```

– *CellIndexList*

The IE *CellIndexList* concerns a list of cell indices, which may be used for different purposes.

CellIndexList information element

```
-- ASN1START

CellIndexList ::=                    SEQUENCE (SIZE (1..maxCellMeas)) OF CellIndex

CellIndex ::=                        INTEGER (1..maxCellMeas)

-- ASN1STOP
```

– *CellReselectionPriority*

The IE *CellReselectionPriority* concerns the absolute priority of the concerned carrier frequency/ set of frequencies (GERAN), as used by the cell reselection procedure. Corresponds with parameter "priority" in TS 36.304 [4]. Value 0 means: lowest priority. The UE behaviour for the case the field is absent, if applicable, is specified in TS 36.304 [4].

CellReselectionPriority information element

```
-- ASN1START

CellReselectionPriority ::=          INTEGER (0..7)

-- ASN1STOP
```

– *CSFB-RegistrationParam1XRTT*

The IE *CSFB-RegistrationParam1XRTT* is used to indicate whether or not the UE shall perform an CDMA2000 1xRTT pre-registration if the UE does not have a valid / current pre-registration.

```
-- ASN1START

CSFB-RegistrationParam1XRTT ::=     SEQUENCE {
    sid                              BIT STRING (SIZE (15)),
    nid                              BIT STRING (SIZE (16)),
    multipleSID                      BOOLEAN,
    multipleNID                      BOOLEAN,
    homeReg                          BOOLEAN,
    foreignSIDReg                    BOOLEAN,
    foreignNIDReg                    BOOLEAN,
    parameterReg                     BOOLEAN,
    powerUpReg                       BOOLEAN,
    registrationPeriod               BIT STRING (SIZE (7)),
    registrationZone                 BIT STRING (SIZE (12)),
    totalZone                        BIT STRING (SIZE (3)),
    zoneTimer                        BIT STRING (SIZE (3))
}

-- ASN1STOP
```

CSFB-RegistrationParam1XRTT field descriptions
sid
Used along with the oneXRTT-NetworkID as a pair to control when the UE should Re-Register with the CDMA2000 1xRTT network.
nid
Used along with the oneXRTT-SystemID as a pair to control when the UE should Re-Register with the CDMA2000 1xRTT network.
multipleSID
The CDMA2000 1xRTT Multiple SID storage indicator.
multipleNID
The CDMA2000 1xRTT Multiple NID storage indicator.
homeReg
The CDMA2000 1xRTT Home registration indicator.
foreignSIDReg
The CDMA2000 1xRTT SID roamer registration indicator.
foreignNIDReg
The CDMA2000 1xRTT NID roamer registration indicator.
parameterReg
The CDMA2000 1xRTT Parameter-change registration indicator.
powerUpReg
The CDMA2000 1xRTT Power-up registration indicator.
registrationPeriod
The CDMA2000 1xRTT Registration period.
registrationZone
The CDMA2000 1xRTT Registration zone.
totalZone
The CDMA2000 1xRTT Number of registration zones to be retained.
zoneTimer
The CDMA2000 1xRTT Zone timer length.

– *CellGlobalIdEUTRA*

The IE *CellGlobalIdEUTRA* specifies the Evolved Cell Global Identifier (ECGI), the globally unique identity of a cell in E-UTRA.

CellGlobalIdEUTRA **information element**

```
-- ASN1START

CellGlobalIdEUTRA ::=                   SEQUENCE {
    plmn-Identity                           PLMN-Identity,
    cellIdentity                            CellIdentity
}

-- ASN1STOP
```

CellGlobalIdEUTRA field descriptions
plmn-Identity
Identifies the PLMN of the cell as given by the first PLMN entry in the *plmn-IdentityList* in *SystemInformationBlockType1*.
cellIdentity
Identity of the cell within the context of the PLMN.

– *CellGlobalIdUTRA*

The IE *CellGlobalIdUTRA* specifies the global UTRAN Cell Identifier, the globally unique identity of a cell in UTRA.

CellGlobalIdUTRA **information element**

```
-- ASN1START

CellGlobalIdUTRA ::=                    SEQUENCE {
```

```
    plmn-Identity                           PLMN-Identity,
    cellIdentity                            BIT STRING (SIZE (28))
}

-- ASN1STOP
```

CellGlobalIdUTRA field descriptions
plmn-Identity
Identifies the PLMN of the cell as given by the common PLMN broadcast in the MIB.
cellIdentity
UTRA Cell Identifier which is unique within the context of the identified PLMN as defined in TS 25.331 [19].

– *CellGlobalIdGERAN*

The IE *CellGlobalIdGERAN* specifies the Cell Global Identification (CGI), the globally unique identity of a cell in GERAN.

***CellGlobalIdGERAN* information element**

```
-- ASN1START

CellGlobalIdGERAN ::=                   SEQUENCE {
    plmn-Identity                           PLMN-Identity,
    locationAreaCode                        BIT STRING (SIZE (16)),
    cellIdentity                        BIT STRING (SIZE (16))
}

-- ASN1STOP
```

CellGlobalIdGERAN field descriptions
plmn-Identity
Identifies the PLMN of the cell.
locationAreaCode
A fixed length code identifying the location area within a PLMN as defined in TS 23.003 [27].
cellIdentity
Cell Identifier which is unique within the context of the GERAN location area as defined in TS 23.003 [27].

– *CellGlobalIdCDMA2000*

The IE *CellGlobalIdCDMA2000* specifies the Cell Global Identification (CGI), the globally unique identity of a cell in CDMA2000.

***CellGlobalIdCDMA2000* information element**

```
-- ASN1START

CellGlobalIdCDMA2000 ::=                CHOICE {
    cellGlobalId1XRTT                       BIT STRING (SIZE (47)),
    cellGlobalIdHRPD                        BIT STRING (SIZE (128))
}

-- ASN1STOP
```

CellGlobalIdCDMA2000 field descriptions
cellGlobalId1XRTT
Unique identifier for a CDMA2000 1xRTT cell, corresponds to BASEID, SID and NID parameters (in that order) defined in C.S0005-A [25].
cellGlobalIdHRPD
Unique identifier for a CDMA2000 HRPD cell, corresponds to SECTOR ID parameter defined in C.S0024-A [26, 14.9].

– *FreqBandIndicator*

The IE *FreqBandIndicator* indicates the E-UTRA operating band as defined in TS 36.101 [42, table 5.5-1].

FreqBandIndicator information element

```
-- ASN1START

FreqBandIndicator ::=                   INTEGER (1..64)

-- ASN1STOP
```

– *MobilityControlInfo*

The IE *MobilityControlInfo* includes parameters relevant for network controlled mobility to/within E-UTRA.

MobilityControlInfo information element

```
-- ASN1START

MobilityControlInfo ::=     SEQUENCE {
    targetPhysCellId                PhysCellId,
    carrierFreq                     CarrierFreqEUTRA                OPTIONAL,   -- Cond HO-
toEUTRA
    carrierBandwidth                CarrierBandwidthEUTRA           OPTIONAL,   -- Cond HO-
toEUTRA
    additionalSpectrumEmission      AdditionalSpectrumEmission      OPTIONAL,   -- Cond HO-
toEUTRA
    t304                            ENUMERATED {
                                        ms50, ms100, ms150, ms200, ms500, ms1000,
                                        ms2000, spare1},
    newUE-Identity                  C-RNTI,
    radioResourceConfigCommon       RadioResourceConfigCommon,
    rach-ConfigDedicated            RACH-ConfigDedicated            OPTIONAL,   -- Need OP
    ...
}

CarrierBandwidthEUTRA ::=           SEQUENCE {
    dl-Bandwidth                    ENUMERATED {
                                        n6, n15, n25, n50, n75, n100, spare10,
                                        spare9, spare8, spare7, spare6, spare5,
                                        spare4, spare3, spare2, spare1},
    ul-Bandwidth                    ENUMERATED {
                                        n6, n15, n25, n50, n75, n100, spare10,
                                        spare9, spare8, spare7, spare6, spare5,
                                        spare4, spare3, spare2, spare1} OPTIONAL -- Need OP
}

CarrierFreqEUTRA ::=                SEQUENCE {
    dl-CarrierFreq                  ARFCN-ValueEUTRA,
    ul-CarrierFreq                  ARFCN-ValueEUTRA                OPTIONAL    -- Cond FDD
}

-- ASN1STOP
```

MobilityControlInfo field descriptions
t304
Timer T304 as described in section 7.3. ms50 corresponds with 50 ms, ms100 corresponds with 100 ms and so on.
dl-Bandwidth
Parameter: *Downlink bandwidth*, see TS 36.101 [42].
ul-Bandwidth
Parameter: *Uplink bandwidth*, see TS 36.101 [42, table 5.6-1]. For TDD, the parameter is absent and it is equal to downlink bandwidth. If absent for FDD, apply the same value as applies for the downlink bandwidth.
rach-ConfigDedicated
The dedicated random access parameters. If absent the UE applies contention based random access as specified in TS 36.321 [6].
carrierBandwidth
Provides the parameters *Downlink bandwidth*, and *Uplink bandwidth*, see TS 36.101 [42].

Conditional presence	Explanation
FDD	The field is mandatory with default value (the default duplex distance defined for the concerned band, as specified in TS 36.101 [42]) in case of "FDD"; otherwise the field is not present.
HO-toEUTRA	The field is mandatory present in case of inter-RAT handover to E-UTRA; otherwise the field is optionally present, need ON.

– *MobilityParametersCDMA2000 (1xRTT)*

The *MobilityParametersCDMA2000* contains the parameters provided to the UE for handover and CSFB support,as. defined in C.S0097 [50].

MobilityParametersCDMA2000 information element

```
-- ASN1START

MobilityParametersCDMA2000 ::=         OCTET STRING

-- ASN1STOP
```

– *MobilityStateParameters*

The IE *MobilityStateParameters* contains parameters to determine UE mobility state.

MobilityStateParameters information element

```
-- ASN1START

MobilityStateParameters ::=           SEQUENCE {
    t-Evaluation                          ENUMERATED {
                                              s30, s60, s120, s180, s240, spare3, spare2, spare1},
    t-HystNormal                          ENUMERATED {
                                              s30, s60, s120, s180, s240, spare3, spare2, spare1},
    n-CellChangeMedium                    INTEGER (1..16),
    n-CellChangeHigh                      INTEGER (1..16)
}

-- ASN1STOP
```

MobilityStateParameters field descriptions
t-Evaluation The duration for evaluating criteria to enter mobility states. Corresponds to T_{CRmax} in TS 36.304 [4]. Value in seconds, s30 corresponds to 30 s and so on.
t-HystNormal The additional duration for evaluating criteria to enter normal mobility state. Corresponds to $T_{CRmaxHyst}$ in TS 36.304 [4]. Value in seconds, s30 corresponds to 30 s and so on.
n-CellChangeMedium The number of cell changes to enter medium mobility state. Corresponds to N_{CR_M} in TS 36.304 [4].
n-CellChangeHigh The number of cell changes to enter high mobility state. Corresponds to N_{CR_H} in TS 36.304 [4].

– *MultiBandInfoList*

MultiBandInfoList information element

```
-- ASN1START

MultiBandInfoList ::=    SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator

-- ASN1STOP
```

– *PhysCellId*

The IE *PhyslCellId* is used to indicate the physical layer identity of the cell, as defined in TS 36.211 [21].

PhysCellId information element

```
-- ASN1START

PhysCellId ::=                      INTEGER (0..503)

-- ASN1STOP
```

– *PhysCellIdRange*

The IE *PhysCellIdRange* is used to encode either a single or a range of physical cell identities. The range is encoded by using a *start* value and by indicating the number of consecutive physical cell identities (including *start*) in the range.

PhysCellIdRange information element

```
-- ASN1START

PhysCellIdRange ::=                 SEQUENCE {
    start                           PhysCellId,
    range                           ENUMERATED {
                                        n4, n8, n12, n16, n24, n32, n48, n64, n84,
                                        n96, n128, n168, n252, n504, spare2,
                                        spare1}                OPTIONAL    -- Need OP
}

-- ASN1STOP
```

PhysCellIdRange field descriptions
start
Indicates the lowest physical cell identity in the range.
range
Indicates the number of physical cell identities in the range (including *start*). Value n4 corresponds with 4, n8 corresponds with 8 and so on. The UE shall apply value 1 in case the field is absent, in which case only the physical cell identity value indicated by *start* applies.

– *PhysCellIdCDMA2000*

The IE *PhysCellIdCDMA2000* identifies the PNOffset that represents the "Physical cell identity" in CDMA2000.

PhysCellIdCDMA2000 information element

```
-- ASN1START

PhysCellIdCDMA2000 ::=          INTEGER (0..maxPNOffset)

-- ASN1STOP
```

– *PhysCellIdGERAN*

The IE *PhysCellIdGERAN* contains the Base Station Identity Code (BSIC).

PhysCellIdGERAN information element

```
-- ASN1START

PhysCellIdGERAN ::=                 SEQUENCE {
    networkColourCode               BIT STRING (SIZE (3)),
    baseStationColourCode           BIT STRING (SIZE (3))
}
```

```
-- ASN1STOP
```

***PhysCellIdGERAN* field descriptions**
networkColourCode
Network Colour Code as defined in TS 23.003 [27].
baseStationColourCode
Base station Colour Code as defined in TS 23.003 [27].

– *PhysCellIdentityUTRA-FDD*

The IE *PhysCellIdUTRA-FDD* is used to indicate the physical layer identity of the cell, i.e. the primary scrambling code, as defined in TS 25.331 [19].

PhysCellIdUTRA-FDD information element

```
-- ASN1START

PhysCellIdUTRA-FDD ::=              INTEGER (0..511)

-- ASN1STOP
```

– *PhysCellIdUTRA-TDD*

The IE *PhysCellIdUTRA-TDD* is used to indicate the physical layer identity of the cell, i.e. the cell parameters ID (TDD), as specified in TS 25.331 [19]. Also corresponds to the Initial Cell Parameter Assignment in TS 25.223 [46].

PhysCellIdUTRA-TDD information element

```
-- ASN1START

PhysCellIdUTRA-TDD ::=             INTEGER (0..127)

-- ASN1STOP
```

– *PLMN-Identity*

The IE *PLMN-Identity* identifies a Public Land Mobile Network. Further information regarding how to set the IE are specified in TS 23.003 [27].

PLMN-Identity information element

```
-- ASN1START

PLMN-Identity ::=                   SEQUENCE {
    mcc                             MCC                 OPTIONAL,            -- Cond MCC
    mnc                             MNC
}

MCC ::=                             SEQUENCE (SIZE (3)) OF
                                        MCC-MNC-Digit

MNC ::=                             SEQUENCE (SIZE (2..3)) OF
                                        MCC-MNC-Digit

MCC-MNC-Digit ::=                   INTEGER (0..9)


-- ASN1STOP
```

PLMN-Identity field descriptions
mcc
The first element contains the first MCC digit, the second element the second MCC digit and so on. If the field is absent, it takes the same value as the mcc of the immediately preceding IE PLMN-Identity. See TS 23.003 [27].
mnc
The first element contains the first MNC digit, the second element the second MNC digit and so on. See TS 23.003 [27].

Conditional presence	**Explanation**
MCC	This IE is mandatory when _PLMN-Identity_ is included in _CellGlobalIdEUTRA_, in _CellGlobalIdUTRA,_ in _CellGlobalIdGERAN_ or in _RegisteredMME_. This IE is also mandatory in the first occurrence of the IE _PLMN-Identity_ within the IE _PLMN-IdentityList_. Otherwise it is optional, need OP.

– _PreRegistrationInfoHRPD_

```
-- ASN1START

PreRegistrationInfoHRPD ::=         SEQUENCE {
    preRegistrationAllowed             BOOLEAN,
    preRegistrationZoneId              PreRegistrationZoneIdHRPD  OPTIONAL, -- cond PreRegAllowed
    secondaryPreRegistrationZoneIdList SecondaryPreRegistrationZoneIdListHRPD  OPTIONAL -- Need OR
}

SecondaryPreRegistrationZoneIdListHRPD ::=  SEQUENCE (SIZE (1..2)) OF PreRegistrationZoneIdHRPD

PreRegistrationZoneIdHRPD ::=          INTEGER (0..255)

-- ASN1STOP
```

PreRegistrationInfoHRPD field descriptions
preRegistrationAllowed
TRUE indicates that a UE shall perform a CDMA2000 HRPD pre-registration if the UE does not have a valid / current pre-registration. FALSE indicates that the UE is not allowed to perform CDMA2000 HRPD pre-registration in the current cell.
preRegistrationZoneID
ColorCode (see C.S0024-A [26], C.S0087-0 [44]) of the CDMA2000 Reference Cell corresponding to the HRPD sector under the HRPD AN that is configured for this LTE cell. It is used to control when the UE should register or re-register.
secondaryPreRegistrationZoneIdList
List of SecondaryColorCodes (see C.S0024-A [26], C.S0087-0 [44]) of the CDMA2000 Reference Cell corresponding to the HRPD sector under the HRPD AN that is configured for this LTE cell. They are used to control when the UE should re-register.

Conditional presence	**Explanation**
PreRegAllowed	The field is mandatory in case the _preRegistrationAllowed_ is set to 'true'. Otherwise the field is not present and the UE shall delete any existing value for this field.

– _Q-RxLevMin_

The IE _Q-RxLevMin_ is used to indicate for cell re-selection the required minimum received RSRP level in the (E-UTRA) cell. Corresponds to parameter $Q_{rxlevmin}$ in 36.304 [4]. Actual value $Q_{rxlevmin}$ = IE value * 2 [dBm].

Q-RxLevMin information element

```
-- ASN1START

Q-RxLevMin ::=                      INTEGER (-70..-22)

-- ASN1STOP
```

– *Q-OffsetRange*

The IE *Q-OffsetRange* is used to indicate a cell or frequency specific offset to be applied when evaluating candidates for cell re-selection or when evaluating triggering conditions for measurement reporting. The value in dB. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.

<p align="center"><i>Q- OffsetRange</i> information element</p>

```
-- ASN1START

Q-OffsetRange ::=                       ENUMERATED {
                                                dB-24, dB-22, dB-20, dB-18, dB-16, dB-14,
                                                dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3,
                                                dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5,
                                                dB6, dB8, dB10, dB12, dB14, dB16, dB18,
                                                dB20, dB22, dB24}

-- ASN1STOP
```

– *Q-OffsetRangeInterRAT*

The IE *Q-OffsetRangeInterRAT* is used to indicate a frequency specific offset to be applied when evaluating triggering conditions for measurement reporting. The value in dB.

<p align="center"><i>Q- OffsetRangeInterRAT</i> information element</p>

```
-- ASN1START

Q-OffsetRangeInterRAT ::=               INTEGER (-15..15)

-- ASN1STOP
```

– *ReselectionThreshold*

The IE *ReselectionThreshold* is used to indicate a threshold for cell reselection. Actual value of threshold in dB = IE value * 2.

<p align="center"><i>ReselectionThreshold</i> information element</p>

```
-- ASN1START

ReselectionThreshold ::=                INTEGER (0..31)

-- ASN1STOP
```

– *SpeedStateScaleFactors*

The IE *SpeedStateScaleFactors* concerns factors, to be applied when the UE is in medium or high speed state, used for scaling a mobility control related parameter.

<p align="center"><i>SpeedStateScaleFactors</i> information element</p>

```
-- ASN1START

SpeedStateScaleFactors ::=          SEQUENCE {
    sf-Medium                           ENUMERATED {oDot25, oDot5, oDot75, lDot0},
    sf-High                             ENUMERATED {oDot25, oDot5, oDot75, lDot0}
}
-- ASN1STOP
```

SpeedStateScaleFactors field descriptions
sf-Medium
The concerned mobility control related parameter is multiplied with this factor if the UE is in Medium Mobility state as defined in TS 36.304 [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
sf-High
The concerned mobility control related parameter is multiplied with this factor if the UE is in High Mobility state as defined in TS 36.304 [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.

– SystemTimeInfoCDMA2000

The IE *SystemTimeInfoCDMA2000* informs the UE about the absolute time in the current cell. The UE uses this absolute time knowledge to derive the CDMA2000 Physical cell identity, expressed as PNOffset, of neighbour CDMA2000 cells.

NOTE: The UE needs the CDMA2000 system time with a certain level of accuracy for performing measurements as well as for communicating with the CDMA2000 network (HRPD or 1xRTT).

SystemTimeInfoCDMA2000 information element

```
-- ASN1START

SystemTimeInfoCDMA2000 ::=          SEQUENCE {
    cdma-EUTRA-Synchronisation          BOOLEAN,
    cdma-SystemTime                     CHOICE {
        synchronousSystemTime               BIT STRING (SIZE (39)),
        asynchronousSystemTime              BIT STRING (SIZE (49))
    }
}

-- ASN1STOP
```

SystemTimeInfoCDMA2000 field descriptions
cdma-EUTRA-Synchronisation
TRUE indicates that the networks are synchronised i.e. there is no drift in the timing between E-UTRA and CDMA2000. FALSE indicates that the networks are not synchronised, i.e. the timing between E-UTRA and CDMA2000 can drift.
synchronousSystemTime
CDMA2000 system time corresponding to the SFN boundary at or after the ending boundary of the SI-window in which *SystemInformationBlockType8* is transmitted. If synchronized to CDMA2000 system time then the size is 39 bits and the unit is 10 ms based on a 1.2288 Mcps chip rate.
asynchronousSystemTime
The CDMA2000 system time corresponding to the SFN boundary at or after the ending boundary of the SI-Window in which SystemInformationBlockType8 is transmitted. If not synchronized then the size is 49 bits and the unit is [8 CDMA2000 chips based on 1.2288 Mcps].

– TrackingAreaCode

The IE TrackingAreaCode is used to identify a tracking area within the scope of a PLMN, see TS 24.301 [35].

TrackingAreaCode information element

```
-- ASN1START

TrackingAreaCode ::=                BIT STRING (SIZE (16))

-- ASN1STOP
```

– T-Reselection

The IE *T-Reselection* concerns the cell reselection timer Treselection$_{RAT}$ for E-UTRA, UTRA, GERAN or CDMA2000. Value in seconds.

<div align="center">**T-Reselection** information element</div>

```
-- ASN1START

T-Reselection ::=                    INTEGER (0..7)

-- ASN1STOP
```

6.3.5 Measurement information elements

– *AllowedMeasBandwidth*

The IE *AllowedMeasBandwidth* is used to indicate the maximum allowed measurement bandwidth on a carrier frequency as defined by the parameter Transmission Bandwidth Configuration "N_{RB}" TS 36.104 [47]. The values mbw6, mbw15, mbw25, mbw50, mbw75, mbw100 indicate 6, 15, 25, 50, 75 and 100 resource blocks respectively.

<div align="center">**AllowedMeasBandwidth** information element</div>

```
-- ASN1START

AllowedMeasBandwidth ::=             ENUMERATED {mbw6, mbw15, mbw25, mbw50, mbw75, mbw100}

-- ASN1STOP
```

– *Hysteresis*

The IE *Hysteresis* is a parameter used within the entry and leave condition of an event triggered reporting condition. The actual value is IE value * 0.5 dB.

<div align="center">**Hysteresis** information element</div>

```
-- ASN1START

Hysteresis ::=                       INTEGER (0..30)

-- ASN1STOP
```

– *MeasConfig*

The IE *MeasConfig* specifies measurements to be performed by the UE, and covers intra-frequency, inter-frequency and inter-RAT mobility as well as configuration of measurement gaps.

<div align="center">**MeasConfig** information element</div>

```
-- ASN1START

MeasConfig ::=                   SEQUENCE {
    -- Measurement objects
    measObjectToRemoveList          MeasObjectToRemoveList           OPTIONAL,   -- Need ON
    measObjectToAddModList          MeasObjectToAddModList           OPTIONAL,   -- Need ON
    -- Reporting configurations
    reportConfigToRemoveList        ReportConfigToRemoveList         OPTIONAL,   -- Need ON
    reportConfigToAddModList        ReportConfigToAddModList         OPTIONAL,   -- Need ON
    -- Measurement identities
    measIdToRemoveList              MeasIdToRemoveList               OPTIONAL,   -- Need ON
    measIdToAddModList              MeasIdToAddModList               OPTIONAL,   -- Need ON
    -- Other parameters
    quantityConfig                  QuantityConfig                   OPTIONAL,   -- Need ON
    measGapConfig                   MeasGapConfig                    OPTIONAL,   -- Need ON
    s-Measure                       RSRP-Range                       OPTIONAL,   -- Need ON
    preRegistrationInfoHRPD         PreRegistrationInfoHRPD          OPTIONAL,   -- Need OP
    speedStatePars          CHOICE {
        release                         NULL,
```

```
        setup                               SEQUENCE {
            mobilityStateParameters             MobilityStateParameters,
            timeToTrigger-SF                    SpeedStateScaleFactors
        }
    }                                                       OPTIONAL,   -- Need ON
    ...
}

MeasIdToRemoveList ::=               SEQUENCE (SIZE (1..maxMeasId)) OF MeasId

MeasObjectToRemoveList ::=           SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectId

ReportConfigToRemoveList ::=         SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigId

-- ASN1STOP
```

MeasConfig field descriptions
measObjectToRemoveList
List of measurement objects to remove.
measObjectId
Used to identify a measurement object configuration.
measObject
Specifies measurement object configurations for E-UTRA, UTRA, GERAN, or CDMA2000 measurements.
reportConfigToRemoveList
List of measurement reporting configurations to remove.
reportConfigId
Used to identify a measurement reporting configuration.
reportConfig
Specifies measurement reporting configurations for E-UTRA, UTRA, GERAN, or CDMA2000 measurements.
measIdToRemoveList
List of measurement identities to remove.
measGapConfig
Used to setup and release measurement gaps.
s-Measure
Serving cell quality threshold controlling whether or not the UE is required to perform measurements of intra-frequency, inter-frequency and inter-RAT neighbouring cells. Value "0" indicates to disable *s-Measure*.
PreRegistrationInfoHRPD
The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.
timeToTrigger-SF
The *timeToTrigger* in *ReportConfigEUTRA* and in *ReportConfigInterRAT* are multiplied with the scaling factor applicable for the UE's speed state.

– *MeasGapConfig*

The IE *MeasGapConfig* specifies the measurement gap configuration and controls setup/ release of measurement gaps.

MeasGapConfig information element

```
-- ASN1START

MeasGapConfig ::=                   CHOICE {
    release                             NULL,
    setup                               SEQUENCE {
        gapOffset                           CHOICE {
            gp0                                 INTEGER (0..39),
            gp1                                 INTEGER (0..79),
            ...
        }
    }
}

-- ASN1STOP
```

***MeasGapConfig* field descriptions**
gapOffset   Value *gapOffset* of *gp0* corresponds to gap offset of Gap Pattern Id "0" with MGRP = 40ms, *gapOffset* of *gp1* corresponds to gap offset of Gap Pattern Id "1" with MGRP = 80ms. Also used to specify the measurement gap pattern to be applied, as defined in TS 36.133 [16].

– *MeasId*

The IE *MeasId* is used to identify a measurement configuration, i.e., linking of a measurement object and a reporting configuration.

MeasId information element

```
-- ASN1START

MeasId ::=                        INTEGER (1..maxMeasId)

-- ASN1STOP
```

– *MeasIdToAddModList*

The IE *MeasIdToAddModList* concerns a list of measurement identities to add or modify, with for each entry the *measId*, the associated *measObjectId* and the associated *reportConfigId*.

MeasIdToAddModList information element

```
-- ASN1START

MeasIdToAddModList ::=            SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddMod

MeasIdToAddMod ::=  SEQUENCE {
    measId                        MeasId,
    measObjectId                  MeasObjectId,
    reportConfigId                ReportConfigId
}

-- ASN1STOP
```

– *MeasObjectCDMA2000*

The IE *MeasObjectCDMA2000* specifies information applicable for inter-RAT CDMA2000 neighbouring cells.

MeasObjectCDMA2000 information element

```
-- ASN1START

MeasObjectCDMA2000 ::=                SEQUENCE {
    cdma2000-Type                     CDMA2000-Type,
    carrierFreq                       CarrierFreqCDMA2000,
    searchWindowSize                  INTEGER (0..15)                OPTIONAL,   -- Need ON
    offsetFreq                        Q-OffsetRangeInterRAT          DEFAULT 0,
    cellsToRemoveList                 CellIndexList                  OPTIONAL,   -- Need ON
    cellsToAddModList                 CellsToAddModListCDMA2000      OPTIONAL,   -- Need ON
    cellForWhichToReportCGI           PhysCellIdCDMA2000             OPTIONAL,   -- Need ON
    ...
}

CellsToAddModListCDMA2000 ::=         SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModCDMA2000

CellsToAddModCDMA2000 ::=    SEQUENCE {
    cellIndex                         INTEGER (1..maxCellMeas),
    physCellId                        PhysCellIdCDMA2000
}

-- ASN1STOP
```

***MeasObjectCDMA2000* field descriptions**
cdma2000-Type
The type of CDMA2000 network: CDMA2000 1xRTT or CDMA2000 HRPD.
carrierInfo
Identifies CDMA2000 carrier frequency for which this configuration is valid.
searchWindowSize
Provides the search window size to be used by the UE for the neighbouring pilot, see C.S0005-A [25].
cellsToRemoveList
List of cells to remove from the neighbouring cell list.
cellsToAddModList
List of cells to add/ modify in the neighbouring cell list.
cellIndex
Entry index in the neighbouring cell list.
physCellId
CDMA2000 Physical cell identity of a cell in neighbouring cell list expressed as PNOffset.

– MeasObjectEUTRA

The IE *MeasObjectEUTRA* specifies information applicable for intra-frequency or inter-frequency E-UTRA neighbouring cells.

MeasObjectEUTRA information element

```
-- ASN1START

MeasObjectEUTRA ::=                 SEQUENCE {
    carrierFreq                     ARFCN-ValueEUTRA,
    allowedMeasBandwidth            AllowedMeasBandwidth,
    presenceAntennaPort1            PresenceAntennaPort1,
    neighCellConfig                 NeighCellConfig,
    offsetFreq                      Q-OffsetRange              DEFAULT dB0,
    -- Neighbour cell list
    cellsToRemoveList               CellIndexList              OPTIONAL,      -- Need ON
    cellsToAddModList               CellsToAddModList          OPTIONAL,      -- Need ON
    -- Black list
    blackCellsToRemoveList          CellIndexList              OPTIONAL,      -- Need ON
    blackCellsToAddModList          BlackCellsToAddModList     OPTIONAL,      -- Need ON
    cellForWhichToReportCGI         PhysCellId                 OPTIONAL,      -- Need ON
    ...
}

CellsToAddModList ::=               SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod

CellsToAddMod ::=    SEQUENCE {
    cellIndex                       INTEGER (1..maxCellMeas),
    physCellId                      PhysCellId,
    cellIndividualOffset            Q-OffsetRange
}

BlackCellsToAddModList ::=          SEQUENCE (SIZE (1..maxCellMeas)) OF BlackCellsToAddMod

BlackCellsToAddMod ::=   SEQUENCE {
    cellIndex                       INTEGER (1..maxCellMeas),
    physCellIdRange                 PhysCellIdRange
}

-- ASN1STOP
```

MeasObjectEUTRA field descriptions
carrierFreq
Identifies E-UTRA carrier frequency for which this configuration is valid.
offsetFreq
Offset value applicable to the carrier frequency. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
cellsToRemoveList
List of cells to remove from the neighbouring cell list.
cellsToAddModList
List of cells to add/ modify in the neighbouring cell list.
cellIndex
Entry index in the neighbouring cell list. An entry may concern a range of cells, in which case this value applies to the entire range.
physCellId
Physical cell identity of a cell in neighbouring cell list.
cellIndividualOffset
Cell individual offset applicable to a specific neighbouring cell. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
blackCellsToRemoveList
List of cells to remove from the black list of cells.
blackCellsToAddMoList
List of cells to add/ modify in the black list of cells.
physCellIdRange
Physical cell identity or a range of physical cell identities of cells in the black list.

– *MeasObjectGERAN*

The IE *MeasObjectGERAN* specifies information applicable for inter-RAT GERAN neighbouring frequencies.

MeasObjectGERAN information element

```
-- ASN1START

MeasObjectGERAN ::=                 SEQUENCE {
    carrierFreqs                        CarrierFreqsGERAN,
    offsetFreq                          Q-OffsetRangeInterRAT        DEFAULT 0,
    ncc-Permitted                       BIT STRING(SIZE (8))         DEFAULT '11111111'B,
    cellForWhichToReportCGI             PhysCellIdGERAN              OPTIONAL,   -- Need ON
    ...
}

-- ASN1STOP
```

MeasObjectGERAN field descriptions
ncc-Permitted
Field encoded as a bit map, where bit N is set to "0" if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to "1" if a BCCH carrier with NCC = N-1 is permitted for monitoring; N = 1 to 8; bit 1 of the bitmap is the leading bit of the bit string.

– *MeasObjectId*

The IE *MeasObjectId* used to identify a measurement object configuration.

MeasObjectId information element

```
-- ASN1START

MeasObjectId ::=                    INTEGER (1..maxObjectId)

-- ASN1STOP
```

– *MeasObjectToAddModList*

The IE *MeasObjectToAddModList* concerns a list of measurement objects to add or modify

MeasObjectToAddModList information element

```
-- ASN1START

MeasObjectToAddModList ::=              SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectToAddMod

MeasObjectToAddMod ::=  SEQUENCE {
    measObjectId                       MeasObjectId,
    measObject                         CHOICE {
        measObjectEUTRA                    MeasObjectEUTRA,
        measObjectUTRA                     MeasObjectUTRA,
        measObjectGERAN                    MeasObjectGERAN,
        measObjectCDMA2000                 MeasObjectCDMA2000,
        ...
    }
}

-- ASN1STOP
```

– *MeasObjectUTRA*

The IE *MeasObjectUTRA* specifies information applicable for inter-RAT UTRA neighbouring cells.

MeasObjectUTRA information element

```
-- ASN1START

MeasObjectUTRA ::=                    SEQUENCE {
    carrierFreq                          ARFCN-ValueUTRA,
    offsetFreq                           Q-OffsetRangeInterRAT      DEFAULT 0,
    cellsToRemoveList                    CellIndexList              OPTIONAL,        -- Need ON
    cellsToAddModList                    CHOICE {
        cellsToAddModListUTRA-FDD            CellsToAddModListUTRA-FDD,
        cellsToAddModListUTRA-TDD            CellsToAddModListUTRA-TDD
    }                                                               OPTIONAL,        -- Need ON
    cellForWhichToReportCGI              CHOICE {
        utra-FDD                             PhysCellIdUTRA-FDD,
        utra-TDD                             PhysCellIdUTRA-TDD
    }                                                               OPTIONAL,   -- Need ON
    ...
}

CellsToAddModListUTRA-FDD ::=        SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModUTRA-FDD

CellsToAddModUTRA-FDD ::=    SEQUENCE {
    cellIndex                            INTEGER (1..maxCellMeas),
    physCellId                           PhysCellIdUTRA-FDD
}

CellsToAddModListUTRA-TDD ::=        SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModUTRA-TDD

CellsToAddModUTRA-TDD ::=    SEQUENCE {
    cellIndex                            INTEGER (1..maxCellMeas),
    physCellId                           PhysCellIdUTRA-TDD
}

-- ASN1STOP
```

***MeasObjectUTRA* field descriptions**
carrierFreq
Identifies UTRA carrier frequency for which this configuration is valid.
cellsToRemoveList
List of cells to remove from the neighbouring cell list.
cellsToAddModListUTRA-FDD
List of UTRA FDD cells to add/ modify in the neighbouring cell list.
cellsToAddModListUTRA-TDD
List of UTRA TDD cells to add/modify in the neighbouring cell list.
cellIndex
Entry index in the neighbouring cell list.

–   *MeasResults*

The IE *MeasResults* covers measured results for intra-frequency, inter-frequency and inter- RAT mobility.

MeasResults information element

```
-- ASN1START

MeasResults ::=                     SEQUENCE {
    measId                              MeasId,
    measResultServCell                  SEQUENCE {
        rsrpResult                          RSRP-Range,
        rsrqResult                          RSRQ-Range
    },
    measResultNeighCells                CHOICE {
        measResultListEUTRA                 MeasResultListEUTRA,
        measResultListUTRA                  MeasResultListUTRA,
        measResultListGERAN                 MeasResultListGERAN,
        measResultsCDMA2000                 MeasResultsCDMA2000,
        ...
    }                                                                       OPTIONAL,
    ...
}

MeasResultListEUTRA ::=             SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA

MeasResultEUTRA ::= SEQUENCE {
    physCellId                          PhysCellId,
    cgi-Info                            SEQUENCE {
        cellGlobalId                        CellGlobalIdEUTRA,
        trackingAreaCode                    TrackingAreaCode,
        plmn-IdentityList                   PLMN-IdentityList2              OPTIONAL
    }                                                       OPTIONAL,
    measResult                          SEQUENCE {
        rsrpResult                          RSRP-Range                     OPTIONAL,
        rsrqResult                          RSRQ-Range                     OPTIONAL,
        ...
    }
}

MeasResultListUTRA ::=              SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA

MeasResultUTRA ::=  SEQUENCE {
    physCellId                          CHOICE {
        fdd                                 PhysCellIdUTRA-FDD,
        tdd                                 PhysCellIdUTRA-TDD
    },
    cgi-Info                            SEQUENCE {
        cellGlobalId                        CellGlobalIdUTRA,
        locationAreaCode                    BIT STRING (SIZE (16))         OPTIONAL,
        routingAreaCode                     BIT STRING (SIZE (8))          OPTIONAL,
        plmn-IdentityList                   PLMN-IdentityList2             OPTIONAL
    }                                                       OPTIONAL,
    measResult                          SEQUENCE {
        utra-RSCP                           INTEGER (-5..91)               OPTIONAL,
        utra-EcN0                           INTEGER (0..49)                OPTIONAL,
        ...
    }
}

MeasResultListGERAN ::=             SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultGERAN
```

```
MeasResultGERAN ::= SEQUENCE {
    carrierFreq                         CarrierFreqGERAN,
    physCellId                          PhysCellIdGERAN,
    cgi-Info                            SEQUENCE {
        cellGlobalId                        CellGlobalIdGERAN,
        routingAreaCode                     BIT STRING (SIZE (8))       OPTIONAL
    }                                                                   OPTIONAL,
    measResult                          SEQUENCE {
        rssi                                INTEGER (0..63),
        ...
    }
}

MeasResultsCDMA2000 ::=             SEQUENCE {
    preRegistrationStatusHRPD           BOOLEAN,
    measResultListCDMA2000              MeasResultListCDMA2000
}

MeasResultListCDMA2000 ::=          SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCDMA2000

MeasResultCDMA2000 ::=  SEQUENCE {
    physCellId                          PhysCellIdCDMA2000,
    cgi-Info                            CellGlobalIdCDMA2000               OPTIONAL,
    measResult                          SEQUENCE {
        pilotPnPhase                        INTEGER (0..32767)            OPTIONAL,
        pilotStrength                       INTEGER (0..63),
        ...
    }
}

PLMN-IdentityList2 ::=              SEQUENCE (SIZE (1..5)) OF PLMN-Identity

-- ASN1STOP
```

MeasResults field descriptions
measId
Identifies the measurement identity for which the reporting is being performed.
measResultServCell
Measured result of the serving cell.
measResultListEUTRA
List of measured results for the maximum number of reported best cells for an E-UTRA measurement identity.
rsrpResult
Measured RSRP result of an E-UTRA cell.
The rsrpResult is only reported if configured by the eNB.
rsrqResult
Measured RSRQ result of an E-UTRA cell.
The rsrqResult is only reported if configured by the eNB.
measResultListUTRA
List of measured results for the maximum number of reported best cells for a UTRA measurement identity.
measResultListGERAN
List of measured results for the maximum number of reported best cells or frequencies for a GERAN measurement identity.
measResultsCDMA2000
Contains the CDMA2000 HRPD pre-registration status and the list of CDMA2000 measurements.
preRegistrationStatusHRPD
Set to TRUE if the UE is currently pre-registered with CDMA2000 HRPD. Otherwise set to FALSE. This can be ignored by the eNB for CDMA2000 1xRTT.

***MeasResults* field descriptions**
measResultListCDMA2000
List of measured results for the maximum number of reported best cells for a CDMA2000 measurement identity.
measResult
Measured result of an E-UTRA cell;   Measured result of a UTRA cell;   Measured result of a GERAN cell or frequency; or   Measured result of a CDMA2000 cell.
utra-RSCP
According to CPICH_RSCP in TS 25.133 [29] for FDD and P-CCPCH_RSCP in TS 25.123 [30] for TDD. Thirty-one spare values.
utra-EcN0
According to CPICH_Ec/No in TS 25.133 [29] for FDD. Fourteen spare values. The field is not present for TDD.
rssi
GERAN Carrier RSSI. RXLEV is mapped to a value between 0 and 63, TS 45.008 [28]. When mapping the RXLEV value to the RSSI bit string, the first/leftmost bit of the bit string contains the most significant bit.
locationAreaCode
A fixed length code identifying the location area within a PLMN, as defined in TS 23.003 [27].
routingAreaCode
The RAC identity read from broadcast information, as defined in TS 23.003 [27].
plmn-IdentityList
The list of PLMN Identity read from broadcast information when the multiple PLMN Identities are broadcast. This field contains the list of identities starting from the second entry of PLMN Identities in the broadcast information.
pilotPnPhase
Indicates the arrival time of a CDMA2000 pilot, measured relative to the UE's time reference in units of PN chips, see C.S0005-A [25]. This information is used in SRVCC handover procedure to CDMA2000 1xRTT.
pilotStrength
CDMA2000 Pilot Strength, the ratio of pilot power to total power in the signal bandwidth of a CDMA2000 Forward Channel. See C.S0005-A [25] for CDMA2000 1xRTT and C.S0024-A [26] for CDMA2000 HRPD.

– *QuantityConfig*

The IE *QuantityConfig* specifies the measurement quantities and layer 3 filtering coefficients for E-UTRA and inter-RAT measurements.

QuantityConfig **information element**

```
-- ASN1START

QuantityConfig ::=                  SEQUENCE {
    quantityConfigEUTRA                 QuantityConfigEUTRA                 OPTIONAL,   -- Need ON
    quantityConfigUTRA                  QuantityConfigUTRA                  OPTIONAL,   -- Need ON
    quantityConfigGERAN                 QuantityConfigGERAN                 OPTIONAL,   -- Need ON
    quantityConfigCDMA2000              QuantityConfigCDMA2000              OPTIONAL,   -- Need ON
    ...
}

QuantityConfigEUTRA ::=             SEQUENCE {
    filterCoefficientRSRP               FilterCoefficient                   DEFAULT fc4,
    filterCoefficientRSRQ               FilterCoefficient                   DEFAULT fc4
}

QuantityConfigUTRA ::=              SEQUENCE {
    measQuantityUTRA-FDD                ENUMERATED {cpich-RSCP, cpich-EcN0},
    measQuantityUTRA-TDD                ENUMERATED {pccpch-RSCP},
    filterCoefficient                   FilterCoefficient                   DEFAULT fc4
}

QuantityConfigGERAN ::=             SEQUENCE {
    measQuantityGERAN                   ENUMERATED {rssi},
    filterCoefficient                   FilterCoefficient                   DEFAULT fc2
}

QuantityConfigCDMA2000 ::=          SEQUENCE {
    measQuantityCDMA2000                ENUMERATED {pilotStrength, pilotPnPhaseAndPilotStrength}
}

-- ASN1STOP
```

QuantityConfig field descriptions
quantityConfigEUTRA
Specifies filter configurations for E-UTRA measurements.
quantityConfigUTRA
Specifies quantity and filter configurations for UTRA measurements.
measQuantityUTRA
Measurement quantity used for UTRA measurements.
quantityConfigGERAN
Specifies quantity and filter configurations for GERAN measurements.
measQuantityGERAN
Measurement quantity used for GERAN measurements.
quantityConfigCDMA2000
Specifies quantity configurations for CDMA2000 measurements.
measQuantityCDMA2000
Measurement quantity used for CDMA2000 measurements. *pilotPnPhaseAndPilotStrength* is only applicable for *MeasObjectCDMA2000* of *cdma2000-Type = type1XRTT*.
filterCoefficientRSRP
Specifies the filtering coefficient used for RSRP.
filterCoefficientRSRQ
Specifies the filtering coefficient used for RSRQ.

– *ReportConfigEUTRA*

The IE *ReportConfigEUTRA* specifies criteria for triggering of an E-UTRA measurement reporting event. The E-UTRA measurement reporting events are labelled A*N* with *N* equal to 1, 2 and so on.

Event A1:   Serving becomes better than absolute threshold;

Event A2:   Serving becomes worse than absolute threshold;

Event A3:   Neighbour becomes amount of offset better than serving;

Event A4:   Neighbour becomes better than absolute threshold;

Event A5:   Serving becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

ReportConfigEUTRA information element

```
-- ASN1START

ReportConfigEUTRA ::=               SEQUENCE {
    triggerType                         CHOICE {
        event                               SEQUENCE {
            eventId                             CHOICE {
                eventA1                             SEQUENCE {
                    a1-Threshold                        ThresholdEUTRA
                },
                eventA2                             SEQUENCE {
                    a2-Threshold                        ThresholdEUTRA
                },
                eventA3                             SEQUENCE {
                    a3-Offset                           INTEGER (-30..30),
                    reportOnLeave                       BOOLEAN
                },
                eventA4                             SEQUENCE {
                    a4-Threshold                        ThresholdEUTRA
                },
                eventA5                             SEQUENCE {
                    a5-Threshold1                       ThresholdEUTRA,
                    a5-Threshold2                       ThresholdEUTRA
                },
                ...
            },
            hysteresis                          Hysteresis,
            timeToTrigger                       TimeToTrigger
        },
        periodical                          SEQUENCE {
            purpose                             ENUMERATED {
                                                    reportStrongestCells, reportCGI}
```

```
        }
    },
    triggerQuantity                       ENUMERATED {rsrp, rsrq},
    reportQuantity                        ENUMERATED {sameAsTriggerQuantity, both},
    maxReportCells                        INTEGER (1..maxCellReport),
    reportInterval                        ReportInterval,
    reportAmount                          ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    ...
}

ThresholdEUTRA ::=                CHOICE{
    threshold-RSRP                        RSRP-Range,
    threshold-RSRQ                        RSRQ-Range
}

-- ASN1STOP
```

ReportConfigEUTRA field descriptions
eventId
Choice of E-UTRA event triggered reporting criteria.
aN-ThresholdM
Threshold to be used in EUTRA measurement report triggering condition for event number aN. If multiple thresholds are defined for event number aN, the thresholds are differentiated by M.
a3-Offset
Offset value to be used in EUTRA measurement report triggering condition for event a3. The actual value is IE value * 0.5 dB.
reportOnLeave
Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a cell in *cellsTriggeredList*, as specified in 5.5.4.1.
triggerQuantity
The quantities used to evaluate the triggering condition for the event. The values rsrp and rsrq correspond to Reference Signal Received Power (RSRP) and Reference Signal Received Quality (RSRQ), see TS 36.214 [48].
timeToTrigger
Time during which specific criteria for the event needs to be met in order to trigger a measurement report.
reportQuantity
The quantities to be included in the measurement report. The value both means that both the rsrp and rsrq quantities are to be included in the measurement report.
maxReportCells
Max number of cells, excluding the serving cell, to include in the measurement report.
reportAmount
Number of measurement reports applicable for *triggerType* '*event*' as well as for *triggerType* '*periodical*'. In case *purpose* is set to '*reportCGI*' only value 1 applies.
ThresholdEUTRA
For RSRP: RSRP based threshold for event evaluation. The actual value is IE value – 140 dBm. For RSRQ: RSRQ based threshold for event evaluation. The actual value is (IE value – 40)/2 dB.

– *ReportConfigId*

The IE *ReportConfigId* is used to identify a measurement reporting configuration.

ReportConfigId information element

```
-- ASN1START

ReportConfigId ::=                INTEGER (1..maxReportConfigId)

-- ASN1STOP
```

– *ReportConfigInterRAT*

The IE *ReportConfigInterRAT* specifies criteria for triggering of an inter-RAT measurement reporting event. The inter-RAT measurement reporting events are labelled B*N* with *N* equal to 1, 2 and so on.

Event B1: Neighbour becomes better than absolute threshold;

Event B2: Serving becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

The b1 and b2 event thresholds for CDMA2000 are the CDMA2000 pilot detection thresholds are expressed as an unsigned binary number equal to [-2 x 10 log 10 E_c/I_o] in units of 0.5dB, see C.S0005-A [25] for details.

ReportConfigInterRAT information element

```
-- ASN1START

ReportConfigInterRAT ::=              SEQUENCE {
    triggerType                          CHOICE {
        event                                SEQUENCE {
            eventId                              CHOICE {
                eventB1                              SEQUENCE {
                    b1-Threshold                         CHOICE {
                        b1-ThresholdUTRA                     ThresholdUTRA,
                        b1-ThresholdGERAN                    ThresholdGERAN,
                        b1-ThresholdCDMA2000                 ThresholdCDMA2000
                    }
                },
                eventB2                              SEQUENCE {
                    b2-Threshold1                        ThresholdEUTRA,
                    b2-Threshold2                        CHOICE {
                        b2-Threshold2UTRA                    ThresholdUTRA,
                        b2-Threshold2GERAN                   ThresholdGERAN,
                        b2-Threshold2CDMA2000                ThresholdCDMA2000
                    }
                },
                ...
            },
            hysteresis                       Hysteresis,
            timeToTrigger                    TimeToTrigger
        },
        periodical                           SEQUENCE {
            purpose                              ENUMERATED {
                                                     reportStrongestCells,
                                                     reportStrongestCellsForSON,
                                                     reportCGI}
        }
    },
    maxReportCells                   INTEGER (1..maxCellReport),
    reportInterval                   ReportInterval,
    reportAmount                     ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    ...
}

ThresholdUTRA ::=                 CHOICE{
    utra-RSCP                            INTEGER (-5..91),
    utra-EcN0                            INTEGER (0..49)
}

ThresholdGERAN ::=                INTEGER (0..63)

ThresholdCDMA2000 ::=             INTEGER (0..63)

-- ASN1STOP
```

***ReportConfigInterRAT* field descriptions**
eventId
Choice of inter-RAT event triggered reporting criteria.
bN-ThresholdM
Threshold to be used in inter RAT measurement report triggering condition for event number bN. If multiple thresholds are defined for event number bN, the thresholds are differentiated by M.
timeToTrigger
Time during which specific criteria for the event needs to be met in order to trigger a measurement report.
Purpose
reportStrongestCellsForSON applies only in case *reportConfig* is linked to a *measObject* set to '*measObjectUTRA*' or '*measObjectCDMA2000*'.
maxReportCells
Max number of cells, excluding the serving cell, to include in the measurement report. In case *purpose* is set to '*reportStrongestCellsForSON*' only value 1 applies.
reportAmount
Number of measurement reports applicable for *triggerType* '*event*' as well as for *triggerType* '*periodical*'. In case *purpose* is set to '*reportCGI*' or '*reportStrongestCellsForSON*' only value 1 applies.
ThresholdUTRA
utra-RSCP corresponds to CPICH_RSCP in TS 25.133 [29] for FDD and P-CCPCH_RSCP in TS 25.123 [30] for TDD. *utra-EcN0* corresponds to CPICH_Ec/No in TS 25.133 [29] for FDD, and is not applicable for TDD. For *utra-RSCP*: The actual value is IE value – 115 dBm. For *utra-EcN0*: The actual value is (IE value – 49)/2 dB.
ThresholdGERAN
The actual value is IE value – 110 dBm.

– *ReportConfigToAddModList*

The IE *ReportConfigToAddModList* concerns a list of reporting configurations to add or modify

***ReportConfigToAddModList* information element**

```
-- ASN1START

ReportConfigToAddModList ::=          SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod

ReportConfigToAddMod ::=     SEQUENCE {
    reportConfigId                      ReportConfigId,
    reportConfig                        CHOICE {
        reportConfigEUTRA                   ReportConfigEUTRA,
        reportConfigInterRAT                ReportConfigInterRAT
    }
}

-- ASN1STOP
```

– *ReportInterval*

The *ReportInterval* indicates the interval between periodical reports. The *ReportInterval* is applicable if the UE performs periodical reporting (i.e. when *reportAmount* exceeds 1), for *triggerType* '*event*' as well as for *triggerType* '*periodical*'. Value ms120 corresponds with 120 ms, ms240 corresponds with 240 ms and so on, while value min1 corresponds with 1 min, min6 corresponds with 6 min and so on.

***ReportInterval* information element**

```
-- ASN1START

ReportInterval ::=                  ENUMERATED {
                                        ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240,
                                        min1, min6, min12, min30, min60, spare3, spare2, spare1}

-- ASN1STOP
```

– *RSRP-Range*

The IE *RSRP-Range* specifies the value range used in RSRP measurements and thresholds. Integer value for RSRP according to mapping table in TS 36.133 [16].

RSRP-Range information element

```
-- ASN1START

RSRP-Range ::=                      INTEGER(0..97)

-- ASN1STOP
```

– *RSRQ-Range*

The IE *RSRQ-Range* specifies the value range used in RSRQ measurements and thresholds. Integer value for RSRQ according to mapping table in TS 36.133 [16].

RSRQ-Range information element

```
-- ASN1START

RSRQ-Range ::=                      INTEGER(0..34)

-- ASN1STOP
```

– *TimeToTrigger*

The IE *TimeToTrigger* specifies the value range used for time to trigger parameter, which concerns the time during which specific criteria for the event needs to be met in order to trigger a measurement report. Value ms0 corresponds to 0 ms, ms40 corresponds to 40 ms, and so on.

TimeToTrigger information element

```
-- ASN1START

TimeToTrigger ::=                   ENUMERATED {
                                      ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256,
                                      ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560,
                                      ms5120}

-- ASN1STOP
```

6.3.6   Other information elements

– *C-RNTI*

The IE *C-RNTI* identifies a UE having a RRC connection within a cell.

C-RNTI information element

```
-- ASN1START

C-RNTI ::=                          BIT STRING (SIZE (16))

-- ASN1STOP
```

– *DedicatedInfoCDMA2000*

The *DedicatedInfoCDMA200*0 is used to transfer UE specific CDMA2000 information between the network and the UE. The RRC layer is transparent for this information.

DedicatedInfoCDMA2000 information element

```
-- ASN1START

DedicatedInfoCDMA2000 ::=              OCTET STRING

-- ASN1STOP
```

– *DedicatedInfoNAS*

The IE *DedicatedInfoNAS* is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this information.

DedicatedInfoNAS information element

```
-- ASN1START

DedicatedInfoNAS ::=        OCTET STRING

-- ASN1STOP
```

– *FilterCoefficient*

The IE *FilterCoefficient* specifies the measurement filtering coefficient. Value *fc0* corresponds to k = 0, *fc1* corresponds to k = 1, and so on.

FilterCoefficient information element

```
-- ASN1START

FilterCoefficient ::=                   ENUMERATED {
                            fc0, fc1, fc2, fc3, fc4, fc5,
                            fc6, fc7, fc8, fc9, fc11, fc13,
                            fc15, fc17, fc19, spare1, ...}

-- ASN1STOP
```

– *MMEC*

The IE *MMEC* identifies an MME within the scope of an MME Group within a PLMN, see TS 23.003 [27].

MMEC information element

```
-- ASN1START

MMEC ::=                          BIT STRING (SIZE (8))

-- ASN1STOP
```

– *NeighCellConfig*

The IE *NeighCellConfig* is used to provide the information related to MBSFN and TDD UL/DL configuration of neighbour cells.

NeighCellConfig information element

```
-- ASN1START

NeighCellConfig ::=         BIT STRING (SIZE (2))

-- ASN1STOP
```

***NeighCellConfig* field descriptions**
neighCellConfig Provides information related to MBSFN and TDD UL/DL configuration of neighbour cells of this frequency 00: Not all neighbour cells have the same MBSFN subframe allocation as serving cell 10: The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell 01: No MBSFN subframes are present in all neighbour cells 11: Different UL/DL allocation in neighbouring cells for TDD compared to the serving cell For TDD, 00, 10 and 01 are only used for same UL/DL allocation in neighbouring cells compared to the serving cell.

– RAND-CDMA2000 (1xRTT)

The *RAND-CDMA200*0 concerns a random value, generated by the eNB, to be passed to the CDMA2000 upper layers.

RAND-CDMA2000 information element

```
-- ASN1START

RAND-CDMA2000 ::=                         BIT STRING (SIZE (32))

-- ASN1STOP
```

– RAT-Type

The IE *RAT-Type* is used to indicate the radio access technology (RAT), including E-UTRA, of the requested/ transferred UE capabilities.

RAT-Type information element

```
-- ASN1START

RAT-Type ::=                          ENUMERATED {
                                        eutra, utra, geran-cs, geran-ps, cdma2000-1XRTT,
                                        spare3, spare2, spare1, ...}

-- ASN1STOP
```

– RRC-TransactionIdentifier

The IE *RRC-TransactionIdentifier* is used, together with the message type, for the identification of an RRC procedure (transaction).

RRC-TransactionIdentifier information element

```
-- ASN1START

RRC-TransactionIdentifier ::=       INTEGER (0..3)

-- ASN1STOP
```

– S-TMSI

The IE *S-TMSI* contains an S-Temporary Mobile Subscriber Identity, a temporary UE identity provided by the EPC which uniquely identifies the UE within the tracking area, see TS 23.003 [27].

S-TMSI information element

```
-- ASN1START

S-TMSI ::=                            SEQUENCE {
    mmec                                MMEC,
    m-TMSI                              BIT STRING (SIZE (32))
}
```

```
-- ASN1STOP
```

S-TMSI field descriptions
m-TMSI
The first/leftmost bit of the bit string contains the most significant bit of the M-TMSI.

– UE-CapabilityRAT-ContainerList

The IE *UE-CapabilityRAT-ContainerList* contains list of containers, one for each RAT for which UE capabilities are transferred, if any.

UE-CapabilityRAT-ContainerList information element

```
-- ASN1START

UE-CapabilityRAT-ContainerList ::=SEQUENCE (SIZE (0..maxRAT-Capabilities)) OF UE-CapabilityRAT-
Container

UE-CapabilityRAT-Container ::= SEQUENCE {
    rat-Type                        RAT-Type,
    ueCapabilityRAT-Container        OCTET STRING
}

-- ASN1STOP
```

UECapabilityRAT-ContainerList field descriptions
ueCapabilityRAT-Container
Container for the UE capabilities of the indicated RAT. The encoding is defined in the specification of each RAT:
For E-UTRA: the encoding of UE capabilities is defined in IE *UE-EUTRA-Capability*.
For UTRA: the octet string contains the INTER RAT HANDOVER INFO message defined in TS 25.331 [19].
For GERAN CS: the octet string contains the concatenated string of the Mobile Station Classmark 2 and Mobile Station Classmark 3. The first 5 octets correspond to Mobile Station Classmark 2 and the following octets correspond to Mobile Station Classmark 3. The Mobile Station Classmark 2 is formatted as 'TLV' and is coded in the same way as the *Mobile Station Classmark 2* information element in TS 24.008 [49]. The first octet is the *Mobile station classmark 2 IEI* and its value shall be set to 33H. The second octet is the *Length of mobile station classmark 2* and its value shall be set to 3. The octet 3 contains the first octet of the value part of the *Mobile Station Classmark 2* information element, the octet 4 contains the second octet of the value part of the *Mobile Station Classmark 2* information element and so on. For each of these octets, the first/ leftmost/ most significant bit of the octet contains b8 of the corresponding octet of the Mobile Station Classmark 2. The Mobile Station Classmark 3 is formatted as 'V' and is coded in the same way as the value part in the *Mobile station classmark 3* information element in TS 24.008 [49]. The sixth octet of this octet string contains octet 1 of the value part of *Mobile station classmark 3*, the seventh of octet of this octet string contains octet 2 of the value part of *Mobile station classmark 3* and so on. Note.
For GERAN PS: the encoding of UE capabilities is formatted as 'V' and is coded in the same way as the value part in the *MS Radio Access Capability* information element in TS 36.306 [5].
For CDMA2000-1XRTT: the octet string contains the A21 Mobile Subscription Information and the encoding of this is defined in A.S0008 [33]. The A21 Mobile Subscription Information contains the supported CDMA2000 1xRTT band class and band sub-class information.

> NOTE: The value part is specified by means of CSN.1, which encoding results in a bit string, to which final padding may be appended up to the next octet boundary TS 24.008 [49]. The first/ leftmost bit of the CSN.1 bit string is placed in the first/ leftmost/ most significant bit of the first octet. This continues until the last bit of the CSN.1 bit string, which is placed in the last/ rightmost/ least significant bit of the last octet.

– UE-EUTRA-Capability

The IE *UE-EUTRA-Capability* is used to convey the E-UTRA UE Radio Access Capability Parameters, see TS 36.306 [5], and the Feature Group Indicators for mandatory features (defined in Annex B.1) to the network. The IE *UE-EUTRA-Capability* is transferred in E-UTRA or in another RAT.

UE-EUTRA-Capability information element

```
-- ASN1START

UE-EUTRA-Capability ::=            SEQUENCE {
```

```
    accessStratumRelease                AccessStratumRelease,
    ue-Category                         INTEGER (1..5),
    pdcp-Parameters                     PDCP-Parameters,
    phyLayerParameters                  PhyLayerParameters,
    rf-Parameters                       RF-Parameters,
    measParameters                      MeasParameters,
    featureGroupIndicators              BIT STRING (SIZE (32))          OPTIONAL,
    interRAT-Parameters                 SEQUENCE {
        utraFDD                             IRAT-ParametersUTRA-FDD        OPTIONAL,
        utraTDD128                          IRAT-ParametersUTRA-TDD128          OPTIONAL,
        utraTDD384                          IRAT-ParametersUTRA-TDD384          OPTIONAL,
        utraTDD768                          IRAT-ParametersUTRA-TDD768          OPTIONAL,
        geran                               IRAT-ParametersGERAN               OPTIONAL,
        cdma2000-HRPD                       IRAT-ParametersCDMA2000-HRPD        OPTIONAL,
        cdma2000-1xRTT                      IRAT-ParametersCDMA2000-1XRTT       OPTIONAL
    },
    nonCriticalExtension                SEQUENCE {}                    OPTIONAL
}

AccessStratumRelease ::=            ENUMERATED {
                                    rel8, spare7, spare6, spare5, spare4, spare3,
                                    spare2, spare1, ...}

PDCP-Parameters ::=                SEQUENCE {
    supportedROHC-Profiles             SEQUENCE {
        profile0x0001                      BOOLEAN,
        profile0x0002                      BOOLEAN,
        profile0x0003                      BOOLEAN,
        profile0x0004                      BOOLEAN,
        profile0x0006                      BOOLEAN,
        profile0x0101                      BOOLEAN,
        profile0x0102                      BOOLEAN,
        profile0x0103                      BOOLEAN,
        profile0x0104                      BOOLEAN
    },
    maxNumberROHC-ContextSessions      ENUMERATED {
                                       cs2, cs4, cs8, cs12, cs16, cs24, cs32,
                                       cs48, cs64, cs128, cs256, cs512, cs1024,
                                       cs16384, spare2, spare1}            DEFAULT cs16,
    ...
}

PhyLayerParameters ::=             SEQUENCE {
    ue-TxAntennaSelectionSupported     BOOLEAN,
    ue-SpecificRefSigsSupported        BOOLEAN
}

RF-Parameters ::=                  SEQUENCE {
    supportedBandListEUTRA             SupportedBandListEUTRA
}

SupportedBandListEUTRA ::=         SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA

SupportedBandEUTRA ::=             SEQUENCE {
    bandEUTRA                          INTEGER (1..64),
    halfDuplex                         BOOLEAN
}

MeasParameters ::=                 SEQUENCE {
    bandListEUTRA                      BandListEUTRA
}

BandListEUTRA ::=                  SEQUENCE (SIZE (1..maxBands)) OF BandInfoEUTRA

BandInfoEUTRA ::=                  SEQUENCE {
    interFreqBandList                  InterFreqBandList,
    interRAT-BandList                  InterRAT-BandList     OPTIONAL
}

InterFreqBandList ::=              SEQUENCE (SIZE (1..maxBands)) OF InterFreqBandInfo

InterFreqBandInfo ::=              SEQUENCE {
    interFreqNeedForGaps               BOOLEAN
}

InterRAT-BandList ::=              SEQUENCE (SIZE (1..maxBands)) OF InterRAT-BandInfo

InterRAT-BandInfo ::=              SEQUENCE {
```

```
     interRAT-NeedForGaps             BOOLEAN
}

IRAT-ParametersUTRA-FDD ::=          SEQUENCE {
    supportedBandListUTRA-FDD        SupportedBandListUTRA-FDD
}

SupportedBandListUTRA-FDD ::=        SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-FDD

SupportedBandUTRA-FDD ::=            ENUMERATED {
                                         bandI, bandII, bandIII, bandIV, bandV, bandVI,
                                         bandVII, bandVIII, bandIX, bandX, bandXI,
                                         bandXII, bandXIII, bandXIV, bandXV, bandXVI, ...,
                                         bandXVII-8a0, bandXVIII-8a0, bandXIX-8a0, bandXX-8a0,
                                         bandXXI-8a0, bandXXII-8a0, bandXXIII-8a0, bandXXIV-8a0,
                                         bandXXV-8a0, bandXXVI-8a0, bandXXVII-8a0, bandXXVIII-8a0,
                                         bandXXIX-8a0, bandXXX-8a0, bandXXXI-8a0, bandXXXII-8a0}

IRAT-ParametersUTRA-TDD128 ::=       SEQUENCE {
    supportedBandListUTRA-TDD128     SupportedBandListUTRA-TDD128
}

SupportedBandListUTRA-TDD128 ::=     SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD128

SupportedBandUTRA-TDD128 ::=         ENUMERATED {
                                         a, b, c, d, e, f, g, h, i, j, k, l, m, n,
                                         o, p, ...}

IRAT-ParametersUTRA-TDD384 ::=       SEQUENCE {
    supportedBandListUTRA-TDD384     SupportedBandListUTRA-TDD384
}

SupportedBandListUTRA-TDD384 ::=     SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD384

SupportedBandUTRA-TDD384 ::=         ENUMERATED {
                                         a, b, c, d, e, f, g, h, i, j, k, l, m, n,
                                         o, p, ...}

IRAT-ParametersUTRA-TDD768 ::=       SEQUENCE {
    supportedBandListUTRA-TDD768     SupportedBandListUTRA-TDD768
}

SupportedBandListUTRA-TDD768 ::=     SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD768

SupportedBandUTRA-TDD768 ::=         ENUMERATED {
                                         a, b, c, d, e, f, g, h, i, j, k, l, m, n,
                                         o, p, ...}

IRAT-ParametersGERAN ::=             SEQUENCE {
    supportedBandListGERAN           SupportedBandListGERAN,
    interRAT-PS-HO-ToGERAN           BOOLEAN
}

SupportedBandListGERAN ::=           SEQUENCE (SIZE (1..maxBands)) OF SupportedBandGERAN

SupportedBandGERAN ::=               ENUMERATED {
                                         gsm450, gsm480, gsm710, gsm750, gsm810, gsm850,
                                         gsm900P, gsm900E, gsm900R, gsm1800, gsm1900,
                                         spare5, spare4, spare3, spare2, spare1, ...}

IRAT-ParametersCDMA2000-HRPD ::=     SEQUENCE {
    supportedBandListHRPD            SupportedBandListHRPD,
    tx-ConfigHRPD                    ENUMERATED {single, dual},
    rx-ConfigHRPD                    ENUMERATED {single, dual}
}

SupportedBandListHRPD ::=            SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

IRAT-ParametersCDMA2000-1XRTT ::=    SEQUENCE {
    supportedBandList1XRTT           SupportedBandList1XRTT,
    tx-Config1XRTT                   ENUMERATED {single, dual},
    rx-Config1XRTT                   ENUMERATED {single, dual}
}

SupportedBandList1XRTT ::=           SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

-- ASN1STOP
```

UE-EUTRA-Capability field descriptions
accessStratumRelease
Set to rel8 in this version of the specification.
maxNumberROHC-ContextSessions
Set to the maximum number of concurrently active ROHC contexts supported by the UE. cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on.
ue-Category
UE category as defined in TS 36.306 [5]. Set to values 1 to 5 in this version of the specification.
bandEUTRA
E-UTRA band as defined in TS 36.101 [42].
ue-TxAntennaSelectionSupported
TRUE indicates that the UE is capable of supporting UE transmit antenna selection as described in TS 36.213 [23, 8.7].
halfDuplex
If *halfDuplex* is set to true, only half duplex operation is supported for the band, otherwise full duplex operation is supported.
bandListEUTRA
One entry corresponding to each supported E-UTRA band listed in the same order as in *supportedBandListEUTRA*.
interFreqBandList
One entry corresponding to each supported E-UTRA band listed in the same order as in *supportedBandListEUTRA*.
interFreqNeedForGaps
Indicates need for measurement gaps when operating on the E-UTRA band given by the entry in *bandListEUTRA* and measuring on the E-UTRA band given by the entry in *interFreqBandList*.
interRAT-BandList
One entry corresponding to each supported band of another RAT listed in the same order as in the *interRAT-Parameters*.
interRATNeedForGaps
Indicates need for DL measurement gaps when operating on the E-UTRA band given by the entry in *bandListEUTRA* and measuring on the inter-RAT band given by the entry in the *interRAT-BandList*.
bandUTRA-FDD
UTRA band as defined in TS 25.101 [17].
bandUTRA-TDD128
UTRA band as defined in TS 25.102 [18].
bandUTRA-TDD384
UTRA band as defined in TS 25.102 [18].
bandUTRA-TDD768
UTRA band as defined in TS 25.102 [18].
bandGERAN
GERAN band as defined in TS 45.005 [20].
bandHRPD
CDMA2000 HRPD band class.
band1XRTT
CDMA2000 1xRTT band class.
featureGroupIndicators
The definitions of the bits in the bit string are described in Annex B.

NOTE: The IE *UE-EUTRA-Capability* does not include AS security capability information, since these are the same as the security capabilities that are signalled by NAS. Consequently AS need not provide "man-in-the-middle" protection for the security capabilities.

– UE-TimersAndConstants

The IE *UE-TimersAndConstants* contains timers and constants used by the UE in either RRC_CONNECTED or RRC_IDLE.

UE-TimersAndConstants information element

```
-- ASN1START

UE-TimersAndConstants ::=           SEQUENCE {
    t300                                ENUMERATED {
                                            ms100, ms200, ms300, ms400, ms600, ms1000, ms1500,
                                            ms2000},
    t301                                ENUMERATED {
                                            ms100, ms200, ms300, ms400, ms600, ms1000, ms1500,
                                            ms2000},
```

```
    t310                                ENUMERATED {
                                            ms0, ms50, ms100, ms200, ms500, ms1000, ms2000},
    n310                                ENUMERATED {
                                            n1, n2, n3, n4, n6, n8, n10, n20},
    t311                                ENUMERATED {
                                            ms1000, ms3000, ms5000, ms10000, ms15000,
                                            ms20000, ms30000},
    n311                                ENUMERATED {
                                            n1, n2, n3, n4, n5, n6, n8, n10},
    ...
}

-- ASN1STOP
```

UE-TimersAndConstants **field descriptions**
t3xy
Timers are described in section 7.3. Value ms0 corresponds with 0 ms, ms50 corresponds with 50 ms and so on.
n3xy
Constants are described in section 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on.

6.4   RRC multiplicity and type constraint values

–   Multiplicity and type constraint definitions

```
-- ASN1START

maxBands                INTEGER ::= 64  -- Maximum number of bands listed in EUTRA UE caps
maxCDMA-BandClass       INTEGER ::= 32  -- Maximum value of the CDMA band classes
maxCellBlack            INTEGER ::= 16  -- Maximum number of blacklisted cells
                                        --  listed in SIB type 4 and 5
maxCellInter            INTEGER ::= 16  -- Maximum number of neighbouring inter-frequency
                                        -- cells listed in SIB type 5
maxCellIntra            INTEGER ::= 16  -- Maximum number of neighbouring intra-frequency
                                        -- cells listed in SIB type 4
maxCellMeas             INTEGER ::= 32  -- Maximum number of entries in each of the neighbour
                                        -- cell lists in a measurement object
maxCellReport           INTEGER ::= 8   -- Maximum number of reported cells
maxDRB                  INTEGER ::= 11  -- Maximum number of Data Radio Bearers
maxEARFCN               INTEGER ::= 65535   -- Maximum value of EUTRA carrier fequency
maxFreq                 INTEGER ::= 8   -- Maximum number of EUTRA carrier frequencies
maxGERAN-SI             INTEGER ::= 10  -- Maximum number of GERAN SI blocks that can be
                                        -- provided as part of NACC information
maxGNFG                 INTEGER ::= 16  -- Maximum number of GERAN neighbour freq groups
maxMBSFN-Allocations    INTEGER ::= 8   -- Maximum number of MBSFN frame allocations with
                                        -- different offset
maxMCS-1                INTEGER ::= 16  -- Maximum number of PUCCH formats (MCS)
maxMeasId               INTEGER ::= 32
maxMultiBands           INTEGER ::= 8   -- Maximum number of additional frequency bands
                                        -- that a cell belongs to
maxObjectId             INTEGER ::= 32
maxPageRec              INTEGER ::= 16  --
maxPNOffset             INTEGER ::= 511 -- Maximum number of CDMA2000 PNOffsets
maxRAT-Capabilities     INTEGER ::= 8   -- Maximum number of interworking RATs (incl EUTRA)
maxReportConfigId       INTEGER ::= 32
maxSIB                  INTEGER ::= 32  -- Maximum number of SIBs
maxSIB-1                INTEGER ::= 31
maxSI-Message           INTEGER ::= 32  -- Maximum number of SI messages
maxUTRA-FDD-Carrier     INTEGER ::= 16  -- Maximum number of UTRA FDD carrier frequencies
maxUTRA-TDD-Carrier     INTEGER ::= 16  -- Maximum number of UTRA TDD carrier frequencies

-- ASN1STOP
```
    NOTE: The value of maxDRB align with SA2.

–   End of EUTRA-RRC-Definitions

```
-- ASN1START

END

-- ASN1STOP
```

7 Variables and constants

7.1 UE variables

NOTE: To facilitate the specification of the UE behavioural requirements, UE variables are represented using ASN.1. Unless explicitly specified otherwise, it is however up to UE implementation how to store the variables. The optionality of the IEs in ASN.1 is used only to indicate that the values may not always be available.

– *EUTRA-UE-Variables*

This ASN.1 segment is the start of the E-UTRA UE variable definitions.

```
-- ASN1START

EUTRA-UE-Variables DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    CellIdentity,
    SpeedStateScaleFactors,
    C-RNTI,
    MeasId,
    MeasIdToAddModList,
    MeasObjectToAddModList,
    MobilityStateParameters,
    NeighCellConfig,
    PhysCellId,
    QuantityConfig,
    ReportConfigToAddModList,
    RSRP-Range,
    maxCellMeas,
    maxMeasId
FROM EUTRA-RRC-Definitions;

-- ASN1STOP
```

– *VarMeasConfig*

The UE variable *VarMeasConfig* includes the accumulated configuration of the measurements to be performed by the UE, covering intra-frequency, inter-frequency and inter-RAT mobility related measurements.

VarMeasConfig UE variable

```
-- ASN1START

VarMeasConfig ::=                   SEQUENCE {
    -- Measurement identities
    measIdList                      MeasIdToAddModList                  OPTIONAL,
    -- Measurement objects
    measObjectList                  MeasObjectToAddModList              OPTIONAL,
    -- Reporting configurations
    reportConfigList                ReportConfigToAddModList            OPTIONAL,
    -- Other parameters
    quantityConfig                  QuantityConfig                      OPTIONAL,
    s-Measure                       RSRP-Range                          OPTIONAL,
    speedStatePars                  CHOICE {
        release                         NULL,
        setup                           SEQUENCE {
            mobilityStateParameters         MobilityStateParameters,
            timeToTrigger-SF                SpeedStateScaleFactors
        }
    }                                                                   OPTIONAL
}
```

```
-- ASN1STOP
```

– *VarMeasReportList*

The UE variable *VarMeasReportList* includes information about the measurements for which the triggering conditions have been met.

VarMeasReportList **UE variable**

```
-- ASN1START

VarMeasReportList ::=                  SEQUENCE (SIZE (1..maxMeasId)) OF VarMeasReport

VarMeasReport ::=                      SEQUENCE {
    -- List of measurement that have been triggered
    measId                             MeasId,
    cellsTriggeredList                 CellsTriggeredList          OPTIONAL,
    numberOfReportsSent                INTEGER
}

CellsTriggeredList ::=                 SEQUENCE (SIZE (1..maxCellMeas)) OF PhysCellId

-- ASN1STOP
```

– *VarShortMAC-Input*

The UE variable *VarShortMAC-Input* specifies the input used to generate the shortMAC-I.

VarShortMAC-Input **UE variable**

```
-- ASN1START

VarShortMAC-Input ::=                      SEQUENCE {
    cellIdentity                           CellIdentity,
    physCellId                             PhysCellId,
    c-RNTI                                 C-RNTI
}
-- ASN1STOP
```

VarShortMAC-Input field descriptions
cellIdentity
Set to CellIdentity of the current cell.
physCellId
Set to the physical cell identity of the cell the UE was connected to prior to the failure.
c-RNTI
Set to C-RNTI that the UE had in the cell it was connected to prior to the failure.

– Multiplicity and type constraint definitions

This section includes multiplicity and type constraints applicable (only) for UE variables.

```
-- ASN1START


-- ASN1STOP
```

– End of *EUTRA-UE-Variables*

```
-- ASN1START

END

-- ASN1STOP
```

7.2 Counters

Counter	Reset	Incremented	When reaching max value

7.3 Timers (Informative)

Timer	Start	Stop	At expiry
T300	Transmission of *RRCConnectionRequest*	Reception of *RRCConnectionSetup* or *RRCConnectionReject* message, cell re-selection and upon abortion of connection establishment by upper layers	Perform the actions as specified in 5.3.3.6
T301	Transmission of *RRCConnectionReestablishmentRequest*	Reception of *RRCConnectionReestablishment* or *RRCConnectionReestablishmentReject* message as well as when the selected cell becomes unsuitable	Go to RRC_IDLE
T302	Reception of *RRCConnectionReject* while performing RRC connection establishment	Upon entering RRC_CONNECTED and upon cell re-selection	Inform upper layers about barring alleviation as specified in 5.3.3.7
T303	Access barred while performing RRC connection establishment for mobile originating calls	Upon entering RRC_CONNECTED and upon cell re-selection	Inform upper layers about barring alleviation as specified in 5.3.3.7
T304	Reception of *RRCConnectionReconfiguration* message including the *MobilityControl Info* or reception of *MobilityFromEUTRACommand* message including *CellChangeOrder*	Criterion for successful completion of handover to EUTRA or cell change order is met (the criterion is specified in the target RAT in case of inter-RAT)	In case of cell change order from E-UTRA or intra E-UTRA handover, initiate the RRC connection re-establishment procedure; In case of handover to E-UTRA, perform the actions defined in the specifications applicable for the source RAT.
T305	Access barred while performing RRC connection establishment for mobile originating signalling	Upon entering RRC_CONNECTED and upon cell re-selection	Inform upper layers about barring alleviation as specified in 5.3.3.7
T310	Upon detecting physical layer problems i.e. upon receiving N310 consecutive out-of-sync indications from lower layers	Upon receiving N311 consecutive in-sync indications from lower layers, upon triggering the handover procedure and upon initiating the connection re-establishment procedure	If security is not activated: go to RRC_IDLE else: initiate the connection re-establishment procedure
T311	Upon initiating the RRC connection re-establishment procedure	Selection of a suitable E-UTRA cell or a cell using another RAT.	Enter RRC_IDLE
T320	Upon receiving *t320* or upon cell (re)selection to E-UTRA from another RAT with validity time configured for dedicated priorities (in which case the remaining validity time is applied).	Upon entering RRC_CONNECTED, when PLMN selection is performed on request by NAS, or upon cell (re)selection to another RAT (in which case the timer is carried on to the other RAT).	Discard the cell reselection priority information provided by dedicated signalling.
T321	Upon receiving *measConfig* including a *reportConfig* with the *purpose* set to *reportCGI*	Upon acquiring the information needed to set all fields of *cellGlobalId* for the requested cell, upon receiving *measConfig* that includes removal of the *reportConfig* with the *purpose* set to *reportCGI*	Initiate the measurement reporting procedure, stop performing the related measurements and remove the corresponding *measId*

7.4   Constants

Constant	Usage
N310	Maximum number of consecutive "out-of-sync" indications received from lower layers
N311	Maximum number of consecutive "in-sync" indications received from lower layers

8   Protocol data unit abstract syntax

8.1   General

The RRC PDU contents in clause 6 and clause 10 are described using abstract syntax notation one (ASN.1) as specified in ITU-T Rec. X.680 [13] and X.681 [14]. Transfer syntax for RRC PDUs is derived from their ASN.1 definitions by use of Packed Encoding Rules, unaligned as specified in ITU-T Rec. X.691 [15].

The following encoding rules apply in addition to what has been specified in X.691:

- When a bit string value is placed in a bit-field as specified in 15.6 to 15.11 in X.691, the leading bit of the bit string value shall be placed in the leading bit of the bit-field, and the trailing bit of the bit string value shall be placed in the trailing bit of the bit-field.

NOTE: The terms 'leading bit' and 'trailing bit' are defined in ITU-T Rec. X.680. When using the 'bstring' notation, the leading bit of the bit string value is on the left, and the trailing bit of the bit string value is on the right.

8.2 Structure of encoded RRC messages

An RRC PDU, which is the bit string that is exchanged between peer entities/ across the radio interface contains the basic production as defined in X.691.

RRC PDUs shall be mapped to and from PDCP SDUs (in case of DCCH) or RLC SDUs (in case of PCCH, BCCH or CCCH) upon transmission and reception as follows:

- when delivering an RRC PDU as an PDCP SDU to the PDCP layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the PDCP SDU and onwards; and

- when delivering an RRC PDU as an RLC SDU to the RLC layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the RLC SDU and onwards; and

- upon reception of an PDCP SDU from the PDCP layer, the first bit of the PDCP SDU shall represent the first bit of the RRC PDU and onwards; and

- upon reception of an RLC SDU from the RLC layer, the first bit of the RLC SDU shall represent the first bit of the RRC PDU and onwards.

8.3 Basic production

The 'basic production' is obtained by applying UNALIGNED PER to the abstract syntax value (the ASN.1 description) as specified in X.691. It always contains a multiple of 8 bits.

8.4 Extension

The following rules apply with respect to the use of protocol extensions:

- A transmitter compliant with this version of the specification shall, unless explicitly indicated otherwise on a PDU type basis, set the extension part empty. Transmitters compliant with a later version may send non-empty extensions;

- A transmitter compliant with this version of the specification shall set spare bits to zero;

8.5 Padding

If the encoded RRC message does not fill a transport block, the RRC layer shall add padding bits. This applies to PCCH and BCCH.

Padding bits shall be set to 0 and the number of padding bits is a multiple of 8.
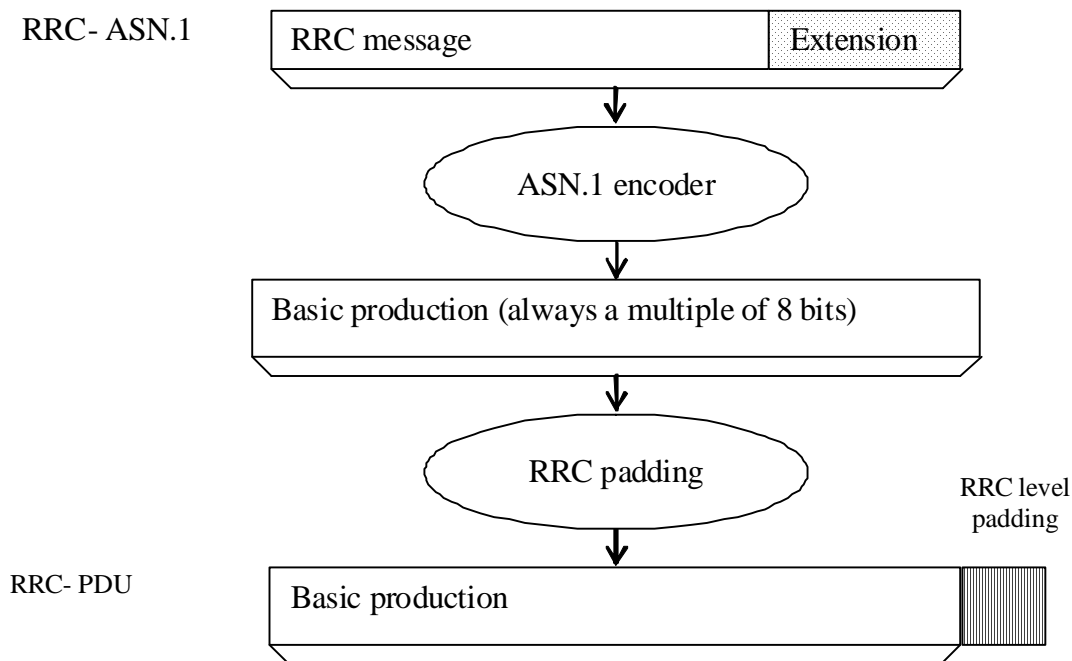
Figure 8.5-1: RRC level padding

9 Specified and default radio configurations

Specified and default configurations are configurations of which the details are specified in the standard. Specified configurations are fixed while default configurations can be modified using dedicated signalling.

9.1 Specified configurations

9.1.1 Logical channel configurations

9.1.1.1 BCCH configuration

Parameters

Name	Value	Semantics description	Ver
PDCP configuration	N/A		
RLC configuration	TM		
MAC configuration	TM		

NOTE: RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

9.1.1.2 CCCH configuration

Parameters

Name	Value	Semantics description	Ver
PDCP configuration	N/A		
RLC configuration	TM		
MAC configuration		Normal MAC headers are used	
Logical channel configuration			
priority	1	Highest priority	
prioritisedBitRate	Infinity		
bucketSizeDuration	N/A		
logicalChannelGroup	0		

9.1.1.3 PCCH configuration

Parameters

Name	Value	Semantics description	Ver
PDCP configuration	N/A		
RLC configuration	TM		
MAC configuration	TM		

NOTE: RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

9.1.2 SRB configurations

9.1.2.1 SRB1

Parameters

Name	Value	Semantics description	Ver
RLC configuration			
logicalChannelIdentity	1		

9.1.2.2 SRB2

Parameters

Name	Value	Semantics description	Ver
RLC configuration			
logicalChannelIdentity	2		

9.2 Default radio configurations

NOTE: Value "N/A" indicates that the UE does not apply a specific value (i.e. upon switching to a default configuration, E-UTRAN can not assume the UE keeps the previously configured value). This implies that E-UTRAN needs to configure a value before invoking the related functionality.

9.2.1 SRB configurations

9.2.1.1 SRB1

Parameters

Name	Value	Semantics description	Ver

Name	Value	Semantics description	Ver
RLC configuration CHOICE	am		
ul-RLC-Config			
>t-PollRetransmit	45		
>pollPDU	Infinity		
>pollByte	Infinity		
>maxRetxThreshold	4		
dl-RLC-Config			
>t-Reordering	35		
>t-StatusProhibit	0		
Logical channel configuration			
priority	1	Highest priority	
prioritisedBitRate	Infinity		
bucketSizeDuration	N/A		
logicalChannelGroup	0		

9.2.1.2 SRB2

Parameters

Name	Value	Semantics description	Ver
RLC configuration CHOICE	am		
ul-RLC-Config			
>t-PollRetransmit	45		
>pollPDU	Infinity		
>pollByte	Infinity		
>maxRetxThreshold	4		
dl-RLC-Config			
>t-Reordering	35		
>t-StatusProhibit	0		
Logical channel configuration			
priority	3		
prioritisedBitRate	Infinity		
bucketSizeDuration	N/A		
logicalChannelGroup	0		

9.2.2 Default MAC main configuration

Parameters

Name	Value	Semantics description	Ver
MAC main configuration			
maxHARQ-tx	5		
periodicBSR-Timer	Infinity		
retxBSR-Timer	sf2560		
ttiBundling	FALSE		
drx-Config	release		
phr-Config	release		

9.2.3 Default semi-persistent scheduling configuration

SPS-Config			
>sps-ConfigDL	release		
>sps-ConfigUL	release		

9.2.4   Default physical channel configuration

Parameters

Name	Value	Semantics description	Ver
PDSCH-ConfigDedicated			
>p-a	dB0		
PUCCH-ConfigDedicated			
> tdd-AckNackFeedbackMode	bundling	Only valid for TDD mode	
>ackNackRepetition	release		
PUSCH-ConfigDedicated			
>betaOffset-ACK-Index	10		
>betaOffset-RI-Index	12		
>betaOffset-CQI-Index	15		
UplinkPowerControlDedicated			
>p0-UE-PUSCH	0		
>deltaMCS-Enabled	en0 (disabled)		
>accumulationEnabled	TRUE		
>p0-UE-PUCCH	0		
>pSRS-Offset	7		
> filterCoefficient	fc4		
tpc-pdcch-ConfigPUCCH	release		
tpc-pdcch-ConfigPUSCH	release		
CQI-ReportConfig			
> CQI-ReportPeriodic	release		
SoundingRS-UL-ConfigDedicated	release		
AntennaInfoDedicated			
>transmissionMode	tm1, tm2	If the number of PBCH antenna ports is one, tm1 is used as default; otherwise tm2 is used as default	
>codebookSubsetRestriction	N/A		
>ue-TransmitAntennaSelection	release		
SchedulingRequestConfig	release		

9.2.5 Default values timers and constants

Parameters

Name	Value	Semantics description	Ver
t310	ms1000		
n310	1		
t311	ms1000		
n311	1		

10 Radio information related interactions between network nodes

10.1 General

This section specifies RRC messages that are transferred between network nodes. These RRC messages may be transferred to or from the UE via another Radio Access Technology. Consequently, these messages have similar characteristics as the RRC messages that are transferred across the E-UTRA radio interface, i.e. the same transfer syntax and protocol extension mechanisms apply.

10.2 Inter-node RRC messages

10.2.1 General

This section specifies RRC messages that are sent either across the X2- or the S1-interface, either to or from the eNB, i.e. a single 'logical channel' is used for all RRC messages transferred across network nodes. The information could originate from or be destined for another RAT.

– *EUTRA-InterNodeDefinitions*

This ASN.1 segment is the start of the E-UTRA inter-node PDU definitions.

```
-- ASN1START

EUTRA-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    AntennaInfoCommon,
    CellIdentity,
    C-RNTI,
    DL-DCCH-Message,
    ARFCN-ValueEUTRA,
    MasterInformationBlock,
    MeasConfig,
    PhysCellId,
    RadioResourceConfigDedicated,
    SecurityAlgorithmConfig,
    ShortMAC-I,
    SystemInformationBlockType1,
    SystemInformationBlockType2,
    UECapabilityInformation,
    UE-CapabilityRAT-ContainerList
FROM EUTRA-RRC-Definitions;

-- ASN1STOP
```

10.2.2 Message definitions

– *HandoverCommand*

This message is used to transfer the handover command generated by the target eNB, which is transparently transferred by the source RAN to the UE.

Direction: target eNB to source eNB/ source RAN

HandoverCommand message

```
-- ASN1START

HandoverCommand ::=                  SEQUENCE {
    criticalExtensions               CHOICE {
        c1                              CHOICE{
            handoverCommand-r8              HandoverCommand-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture        SEQUENCE {}
    }
}

HandoverCommand-r8-IEs ::=           SEQUENCE {
    handoverCommandMessage               OCTET STRING (CONTAINING DL-DCCH-Message),
    nonCriticalExtension                 SEQUENCE {}                           OPTIONAL
}
```

```
-- ASN1STOP
```

HandoverCommand field descriptions
handoverCommandMessage
Contains the entire DL-DCCH-Message including the *RRCConnectionReconfiguration* message used to perform handover to E-UTRAN, generated (entirely) by the target eNB.

– *HandoverPreparationInformation*

This message is used to transfer the E-UTRA RRC information used by the target eNB during handover preparation, including UE capability information.

Direction: source eNB/ source RAN to target eNB

HandoverPreparationInformation message

```
-- ASN1START

HandoverPreparationInformation ::=  SEQUENCE {
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            handoverPreparationInformation-r8   HandoverPreparationInformation-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

HandoverPreparationInformation-r8-IEs ::= SEQUENCE {
    ue-RadioAccessCapabilityInfo        UE-CapabilityRAT-ContainerList,
    as-Config                           AS-Config                       OPTIONAL,        -- Cond HO
    rrm-Config                          RRM-Config                      OPTIONAL,
    as-Context                          AS-Context                      OPTIONAL,        -- Cond HO
    nonCriticalExtension                SEQUENCE {}                     OPTIONAL
}

-- ASN1STOP
```

HandoverPreparationInformation field descriptions
ue-RadioAccessCapabilityInfo
E-UTRA radio access capabilities are always included and in case of inter-RAT handover to E-UTRA, UTRA radio access capabilities may be included. (If UTRA radio access capabilities are received from the source RAN, they are ignored by target eNB.) In case of inter-RAT handover to E-UTRA and the source is GERAN, GERAN capabilities are always included.
as-Config
The complete radio resource configuration. Applicable in case of intra-E-UTRA handover.
rrm-Config
Local E-UTRAN context used depending on the target node's implementation, which is mainly used for the RRM purpose.
as-Context
Local E-UTRAN context required by the target eNB.

Conditional presence	Explanation
HO	The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present.

– *UERadioAccessCapabilityInformation*

This message is used to transfer UE radio access capability information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

UERadioAccessCapabilityInformation message

```
-- ASN1START

UERadioAccessCapabilityInformation ::= SEQUENCE {
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            ueRadioAccessCapabilityInformation-r8
                                            UERadioAccessCapabilityInformation-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

UERadioAccessCapabilityInformation-r8-IEs ::= SEQUENCE {
    ue-RadioAccessCapabilityInfo        OCTET STRING (CONTAINING UECapabilityInformation),
    nonCriticalExtension                SEQUENCE {}                             OPTIONAL
}

-- ASN1STOP
```

UERadioAccessCapabilityInformation field descriptions
ue-RadioAccessCapabilityInfo
Including E-UTRA, GERAN, and CDMA2000-1xRTT Bandclass radio access capabilities (separated). UTRA radio access capabilities are not included.

10.3 Inter-node RRC information element definitions

– AS-Config

The *AS-Config* IE contains information about RRC configuration information in the source cell which can be utilized by target cell to determine the need to change the RRC configuration during the handover preparation phase. The information can also be used after the handover is successfully performed or during the RRC connection re-establishment.

AS-Config information element

```
-- ASN1START

AS-Config ::=             SEQUENCE {
    sourceMeasConfig                    MeasConfig,
    sourceRadioResourceConfig           RadioResourceConfigDedicated,
    sourceSecurityAlgorithmConfig       SecurityAlgorithmConfig,
    sourceUE-Identity                   C-RNTI,
    sourceMasterInformationBlock        MasterInformationBlock,
    sourceSystemInformationBlockType1   SystemInformationBlockType1,
    sourceSystemInformationBlockType2   SystemInformationBlockType2,
    antennaInfoCommon                   AntennaInfoCommon,
    sourceDl-CarrierFreq                ARFCN-ValueEUTRA,
    ...
}

-- ASN1STOP
```

   NOTE: The *AS-Config* re-uses information elements primarily created to cover the radio interface signalling requirements. Consequently, the information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the *MasterInformationBlock*.

AS-Config field descriptions
sourceMeasConfig
Measurement configuration in the source cell. The measurement configuration for all measurements existing in the source cell when handover is triggered shall be included. See 10.5.
sourceRadioResourceConfig
Radio configuration in the source cell. The radio resource configuration for all radio bearers existing in the source cell when handover is triggered shall be included. See 10.5.
sourceSecurityAlgorithmConfig
This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source cell.
sourceMasterInformationBlock
MasterInformationBlock transmitted in the source cell.
sourceSystemInformationBlockType1
SystemInformationBlockType1 transmitted in the source cell.
sourceSystemInformationBlockType2
SystemInformationBlockType2 transmitted in the source cell.
antennaInfoCommon
This field provides information about the number of antenna ports in the source cell.
sourceDL-CarrierFreq
Provides the parameter Downlink EARFCN in the source cell, see TS 36.101 [42].

– AS-Context

The IE *AS-Context* is used to transfer local E-UTRAN context required by the target eNB.

AS-Context information element

```
-- ASN1START

AS-Context ::=                          SEQUENCE {
    reestablishmentInfo                     ReestablishmentInfo        OPTIONAL    -- Cond HO
}

-- ASN1STOP
```

AS-Context field descriptions
reestablishmentInfo
Including information needed for the RRC connection re-establishment.

Conditional presence	Explanation
HO	The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present.

– ReestablishmentInfo

The *ReestablishmentInfo* IE contains information needed for the RRC connection re-establishment.

ReestablishmentInfo information element

```
-- ASN1START

ReestablishmentInfo ::=             SEQUENCE {
    sourcePhysCellId                    PhysCellId,
    targetCellShortMAC-I                ShortMAC-I,
    additionalReestabInfoList           AdditionalReestabInfoList            OPTIONAL,
    ...
}
```

```
AdditionalReestabInfoList ::=        SEQUENCE ( SIZE (1..maxReestabInfo) ) OF AdditionalReestabInfo

AdditionalReestabInfo ::=    SEQUENCE{
    cellIdentity                     CellIdentity,
    key-eNodeB-Star                  Key-eNodeB-Star,
    shortMAC-I                       ShortMAC-I
}

Key-eNodeB-Star ::=                  BIT STRING (SIZE (256))

-- ASN1STOP
```

ReestablishmentInfo field descriptions
sourcePhyCellId
The physical cell identity of the source cell, used to determine the UE context in the target eNB at re-establishment.
targetCellShortMAC-I
The ShortMAC-I for the handover target cell, in order for potential re-establishment to succeed.
additionalReestabInfoList
Contains a list of shortMAC-I and KeNB* for cells under control of the target eNB, required for potential re-establishment by the UE in these cells to succeed.
Key-eNodeB-Star
Parameter KeNB*: See TS 33.401 [32, 7.2.8.4]. This parameter is only used for X2 handover, and for S1 handover, it shall be ignored by target eNB.

– RRM-Config

The *RRM-Config* IE contains information about UE specific RRM information before the handover which can be utilized by target eNB after the handover is successfully performed.

RRM-Config information element

```
-- ASN1START

RRM-Config ::=              SEQUENCE {
    ue-InactiveTime            ENUMERATED {
                                s1, s2, s3, s5, s7, s10, s15, s20,
                                s25, s30, s40, s50, min1, min1s20c, min1s40,
                                min2, min2s30, min3, min3s30, min4, min5, min6,
                                min7, min8, min9, min10, min12, min14, min17, min20,
                                min24, min28, min33, min38, min44, min50, hr1,
                                hr1min30, hr2, hr2min30, hr3, hr3min30, hr4, hr5, hr6,
                                hr8, hr10, hr13, hr16, hr20, day1, day1hr12, day2,
                                day2hr12, day3, day4, day5, day7, day10, day14, day19,
                                day24, day30, dayMoreThan30}        OPTIONAL,
    ...
}

-- ASN1STOP
```

RRM-Config field descriptions
ue-InactiveTime
Duration while UE has not received or transmitted any user data. Thus the timer is still running in case e.g., UE measures the neighbour cells for the HO purpose. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on. Value min1 corresponds to 1 minute, value min1s20 corresponds to 1 minute and 20 seconds, value min1s40 corresponds to 1 minute and 40 seconds and so on. Value hr1 corresponds to 1 hour, hr1min30 corresponds to 1 hour and 30 minutes and so on.

10.4 Inter-node RRC multiplicity and type constraint values

– Multiplicity and type constraints definitions

```
-- ASN1START
```

```
maxReestabInfo               INTEGER ::= 32  -- Maximum number of KeNB* and shortMAC-I forwarded
                                             -- at handover for re-establishment preparation

-- ASN1STOP
```

– End of *EUTRA-InterNodeDefinitions*

```
-- ASN1START

END

-- ASN1STOP
```

10.5 Mandatory information in *AS-Config*

The *AS-Config* transferred between source eNB and target-eNB shall include all IEs necessary to describe the AS context. The conditional presence in section 6 is only applicable for eNB to UE communication.

The "need" or "cond" statements are not applied in case of sending the IEs from source eNB to target eNB. Some information elements shall be included regardless of the "need" or "cond" e.g. *discardTimer*. The *AS-Config* re-uses information elements primarily created to cover the radio interface signalling requirements. The information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the *MasterInformationBlock*.

Within the *sourceRadioResourceConfig* the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explictly specified otherwise in the following:

- in accordance with a condition that is explictly stated to be applicable; or

- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or

- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

Name	Presence in clause 6	Comment
RadioResourceConfigDedicated		
> srb-ToAddModList	OPTIONAL, -Cond HO-Conn	-
>> rlc-Config	OPTIONAL, -Cond Setup	-
>> logicalChannelConfig	OPTIONAL, -Cond Setup	-
>>> ul-SpecificParameters	OPTIONAL, -Cond UL	- The conditional presence applies
>>>> logicalChannelGroup	OPTIONAL, -Need OR	-
>drb-ToAddModList	OPTIONAL, -Cond HO-toEUTRA	-
>> eps-BearerIdentity	OPTIONAL, -Cond DRB-Setup	-
>> pdcp-Config	OPTIONAL, -Cond PDCP	-
>>> discardTimer	OPTIONAL, -Cond Setup	-
>>> rlc-AM	OPTIONAL, -Cond Rlc-AM	- The conditional presence applies
>>> rlc-UM	OPTIONAL, -Cond Rlc-UM	- The conditional presence applies
>> rlc-Config	OPTIONAL, -Cond Setup	-
>> logicalChannelIdentity	OPTIONAL, -Cond DRB-Setup	-
>> logicalChannelConfig	OPTIONAL, -Cond Setup	-
>>> ul-SpecificParameters	OPTIONAL, -Cond UL	- The conditional presence applies
>>>> logicalChannelGroup	OPTIONAL, -Need OR	-
> mac-MainConfig	OPTIONAL, -Need ON	-
>> ul-SCH-Config	OPTIONAL, -Need ON	-
>>> maxHARQ-Tx	OPTIONAL, -Need ON	-
>> periodicBSR-Timer	OPTIONAL, -Need ON	-
>> drx-Config	OPTIONAL, -Need ON	-
>>> shortDRX	OPTIONAL, -Need ON	-
>> phr-Config	OPTIONAL, -Need ON	-
> sps-Config	OPTIONAL, -Need ON	-
>> sps-ConfigDL	OPTIONAL, -Need ON	-
>> sps-ConfigUL	OPTIONAL, -Need ON	-
>>> p0-Persistent	OPTIONAL, -Need OP	-
>>> twoIntervalsConfig	OPTIONAL, -Cond TDD	- The conditional presence applies
> physicalConfigDedicated	OPTIONAL, -Need ON	-
>> pdsch-ConfigDedicated	OPTIONAL, -Need ON	-
>> pucch-ConfigDedicated	OPTIONAL, -Need ON	-
>>> tdd-AckNackFeedbackMode	OPTIONAL, -Cond TDD	- The conditional presence applies
>> pusch-ConfigDedicated	OPTIONAL, -Need ON	-
>> uplinkPowerControlDedicated	OPTIONAL, -Need ON	-
>> tpc-PDCCH-ConfigPUCCH	OPTIONAL, -Need ON	-
>> tpc-PDCCH-ConfigPUSCH	OPTIONAL, -Need ON	-
>> cqi-ReportConfig	OPTIONAL, -Need ON	-
>>> cqi-ReportingModeAperiodic	OPTIONAL, -Need OR	-
>>> cqi-ReportPeriodic	OPTIONAL, -Need ON	-
>> soundingRS-UL-ConfigDedicated	OPTIONAL, -Need ON	-
>> antennaInfo	OPTIONAL, -Need ON	-
>>> codebookSubsetRestriction	OPTIONAL, -Cond TM	- The conditional presence applies
>> schedulingRequestConfig	OPTIONAL, -Need ON	-

For the measurement configuration, a corresponding operation as 5.5.6.1 is executed by target eNB.

Within the *sourceMeasConfig* the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explictly specified otherwise in the following:

- in accordance with a condition that is explictly stated to be applicable; or

- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or

- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

Name	Presence in clause 6	Comment
MeasConfig		
> measObjectToAddModList	OPTIONAL, -Need ON	-
>> measObject	-	-
>>> measObjectEUTRA	-	-
>>>> cellsToAddModList	OPTIONAL, -Need ON	-
>>>> blackCellsToAddModList	OPTIONAL, -Need ON	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
>>> MeasObjectUTRA	-	-
>>>> cellsToAddModList	OPTIONAL, -Need ON	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
>>> MeasObjectGERAN	-	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
>>> MeasObjectCDMA2000	-	-
>>>> searchWindowSize	OPTIONAL, -Need ON	-
>>>> cellsToAddModList	OPTIONAL, -Need ON	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
> reportConfigToAddModList	OPTIONAL, -Need ON	-
> measIdToAddModList	OPTIONAL, -Need ON	-
> quantityConfig	OPTIONAL, -Need ON	-
>> quantityConfigEUTRA	OPTIONAL, -Need ON	-
>> quantityConfigUTRA	OPTIONAL, -Need ON	-
>> quantityConfigGERAN	OPTIONAL, -Need ON	-
>> quantityConfigCDMA2000	OPTIONAL, -Need ON	-
> s-Measure	OPTIONAL, -Need ON	-
> preRegistrationInfoHRPD	OPTIONAL, -Need OP	
>> preRegistrationZoneId	OPTIONAL, -Cond PreRegAllowed	- The conditional presence applies
>> secondaryPreRegistrationZoneIdList	OPTIONAL, -Need OR	-
> speedStatePars	OPTIONAL, -Need ON	-

11 UE capability related constraints and performance requirements

11.1 UE capability related constraints

The following table lists constraints regarding the UE capabilities that E-UTRAN is assumed to take into account.

Parameter	Description	Value
#DRBs	The number of DRBs that a UE of categories 1- 5 shall support	8
#RLC-AM	The number of RLC AM entities that a UE of categories 1- 5 shall support	10
#minCellperMeasObject EUTRA	The minimum number of neighbour cells (excluding black list cells) that a UE shall be able to store within a MeasObjectEUTRA	32
#minBlackCellPCIRang esperMeasObjectEUTR A	The minimum number of blacklist cell PCI ranges that a UE shall be able to store within a MeasObjectEUTRA	32
#minCellperMeasObject UTRA	The minimum number of neighbour cells that a UE shall be able to store within a MeasObjectUTRA	32
#minCellperMeasObject GERAN	The minimum number of neighbour cells that a UE shall be able to store within a measObjectGERAN	32
#minCellperMeasObject CDMA2000	The minimum number of neighbour cells that a UE shall be able to store within a measObjectCDMA2000	32
#minCellTotal	The minimum number of neighbour cells (excluding black list cells) that UE shall be able to store in total in all measurement objects configured	256

11.2 Processing delay requirements for RRC procedures

The UE performance requirements for RRC procedures are specified in the following table, by means of a value N:

N = the number of 1ms subframes from the end of reception of the E-UTRAN -> UE message on the UE physical layer up to when the UE shall be ready for the reception of uplink grant for the UE -> E-UTRAN response message with no access delay other than the TTI-alignment (e.g. excluding delays caused by scheduling, the random access procedure or physical layer synchronisation).
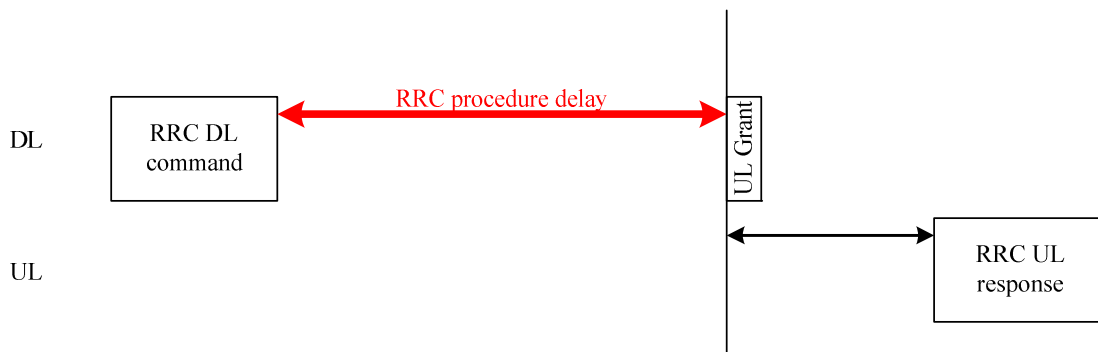
Figure 11.2-1: Illustration of RRC procedure delay

Procedure title:	E-UTRAN -> UE	UE -> E-UTRAN	N	Notes
RRC Connection Control Procedures				
RRC connection establishment	*RRCConnectionSetup*	*RRCConnectionSetupComplete*	15	
RRC connection release	*RRCConnectionSetupRelease*		NA	
RRC connection re-configuration (radio resource configuration)	*RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	15	
RRC connection re-configuration (measurement configuration)	*RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	15	
RRC connection re-configuration (intra-LTE mobility)	*RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	15	
RRC connection re-establishment	*RRCConnectionReestablishment*	*RRCConnectionReestablishmentComplete*	15	
Initial security activation	*SecurityModeCommand*	*SecurityModeCommandComplete/SecurityModeCommandFailure*	10	
Initial security activation + RRC connection re-configuration (RB establishment)	*SecurityModeCommand, RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	20	The two DL messages are transmitted in the same TTI
Paging	*Paging*		NA	
Inter RAT mobilty				
Handover to E-UTRA	*RRCConnectionReconfiguration (sent by other RAT)*	*RRCConnectionReconfigurationComplete*	NA	
Handover from E-UTRA	*MobilityFromEUTRACommand*		NA	
Handover from E-UTRA to CDMA2000	*HandoverFromEUTRAPreparationRequest (CDMA2000)*		NA	Used to trigger the handover preparation procedure with a CDMA2000 RAT.
Measurement procedures				
Measurement Reporting		*MeasurementReport*	NA	
Other procedures				
UE capability transfer	*UECapabilityEnquiry*	*UECapabilityInformation*	10	

Annex A (informative): Guidelines, mainly on use of ASN.1

Editor's note No agreements have been reached concerning the extension of RRC PDUs so far. Any statements in this section about the protocol extension mechanism should be considered as FFS.

A.1   Introduction

The following clauses contain guidelines for the specification of RRC protocol data units (PDUs) with ASN.1.

A.2   Procedural specification

A.2.1   General principles

The procedural specification provides an overall high level description regarding the UE behaviour in a particular scenario.

It should be noted that most of the UE behaviour associated with the reception of a particular field is covered by the applicable parts of the PDU specification. The procedural specification may also include specific details of the UE behaviour upon reception of a field, but typically this should be done only for cases that are not easy to capture in the PDU section e.g. general actions, more complicated actions depending on the value of multiple fields.

Likewise, the procedural specification need not specify the UE requirements regarding the setting of fields within the messages that are send to E-UTRAN i.e. this may also be covered by the PDU specification.

A.2.2   More detailed aspects

The following more detailed conventions should be used:

- Bullets:

    - Capitals should be used in the same manner as in other parts of the procedural text i.e. in most cases no capital applies since the bullets are part of the sentence starting with 'The UE shall:'

    - All bullets, including the last one in a sub-clause, should end with a semi-colon i.e. an ';'

- Conditions

    - Whenever multiple conditions apply, a semi-colon should be used at the end of each conditions with the exception of the last one, i.e. as in 'if cond1; or cond2:

A.3   PDU specification

A.3.1   General principles

A.3.1.1   ASN.1 sections

The RRC PDU contents are formally and completely described using abstract syntax notation (ASN.1), see X.680 [13], X.681 (02/2002) [14].

The complete ASN.1 code is divided into a number of ASN.1 sections in the specifications. In order to facilitate the extraction of the complete ASN.1 code from the specification, each ASN.1 section begins with a text paragraph consisting entirely of an *ASN.1 start tag*, which consists of a double hyphen followed by a single space and the text string "ASN1START" (in all upper case letters). Each ASN.1 section ends with a text paragraph consisting entirely of

an *ASN.1 stop tag*, which consists of a double hyphen followed by a single space and the text "ASN1STOP" (in all upper case letters):

```
-- ASN1START

-- ASN1STOP
```

The text paragraphs containing the ASN.1 start and stop tags should not contain any ASN.1 code significant for the complete description of the RRC PDU contents. The complete ASN.1 code may be extracted by copying all the text paragraphs between an ASN.1 start tag and the following ASN.1 stop tag in the order they appear, throughout the specification.

NOTE: A typical procedure for extraction of the complete ASN.1 code consists of a first step where the entire RRC PDU contents description (ultimately the entire specification) is saved into a plain text (ASCII) file format, followed by a second step where the actual extraction takes place, based on the occurrence of the ASN.1 start and stop tags.

A.3.1.2 ASN.1 identifier naming conventions

The naming of identifiers (i.e., the ASN.1 field and type identifiers) should be based on the following guidelines:

- Message (PDU) identifiers should be ordinary mixed case without hyphenation. These identifiers, *e.g.*, the *RRCConnectionModificationCommand*, should be used for reference in the procedure text. Abbreviated forms of these identifiers should not be used.

- Type identifiers other than PDU identifiers should be ordinary mixed case, with hyphenation used to set off acronyms only where an adjacent letter is a capital, *e.g.*, *EstablishmentCause, SelectedPLMN* (not *Selected-PLMN*, since the "d" in "Selected" is lowercase)*, InitialUE-Identity* and *MeasSFN-SFN-TimeDifference*.

- Field identifiers shall start with a lowercase letter and use mixed case thereafter, *e.g.*, *establishmentCause*. If a field identifier begins with an acronym (which would normally be in upper case), the entire acronym is lowercase (*plmn-Identity*, not *pLMN-Identity*). The acronym is set off with a hyphen (*ue-Identity*, not *ueIdentity*), in order to facilitate a consistent search pattern with corresponding type identifiers.

- Identifiers that are likely to be keywords of some language, especially widely used languages, such as C++ or Java, should be avoided to the extent possible.

- Identifiers, other than PDU identifiers, longer than 25 characters should be avoided where possible. It is recommended to use abbreviations, which should be done in a consistent manner i.e. use 'Meas' instead of 'Measurement' for all occurrences. Examples of typical abbreviations are given in table A.3.1.2.1-1 below.

- *For future extension:* When an extension is introduced a suffix is added to the identifier of the concerned ASN.1 field and/ or type. A suffix of the form "-rX" is used, with X indicating the release, for ASN.1 fields or types introduced in a later release (i.e. a release later than the original/ first release of the protocol) as well as for ASN.1 fields or types for which a revision is introduced in a later release replacing a previous version, *e.g.*, *Foo-r9* for the Rel-9 version of the ASN.1 type *Foo*. A suffix of the form "-vXYZ" is used for ASN.1 fields or types that only are an extension of a corresponding earlier field or type (see sub-clause A.4), e.g., *AnElement-v10b0* for the extension of the ASN.1 type *AnElement* introduced in version 10.11.0 of the specification. A number *0...9, 10, 11, etc.* is used to represent the first part of the version number, indicating the release of the protocol. Lower case letters *a, b, c, etc.* are used to represent the second (and third) part of the version number if they are greater than 9.

- More generally, in case there is a need to distinguish different variants of an ASN.1 field or IE, a suffix should be added at the end of the identifiers e.g. *MeasObjectUTRAN, ConfigCommon*. When there is no particular need to distinguish the fields (e.g. because the field is included in different IEs), a common field identifier name may be used. This may be attractive e.g. in case the procedural specification is the same for the different variants.

Table A.3.1.2-1: Examples of typical abbreviations used in ASN.1 identifiers

Abbreviation	Abbreviated word
Conf	Confirmation
Config	Configuration
DL	Downlink
Freq	Frequency
Id	Identity
Ind	Indication
Info	Information
Meas	Measurement
Neigh	Neighbour(ing)
Param(s)	Parameter(s)
Persist	Persistent
Phys	Physical
Reestab	Reestablishment
Req	Request
Sched	Scheduling
Thresh	Threshold
Transm	Transmission
UL	Uplink

NOTE: The table A.3.1.2.1-1 is not exhaustive. Additional abbreviations may be used in ASN.1 identifiers when needed.

A.3.1.3   Text references using ASN.1 identifiers

A text reference into the RRC PDU contents description from other parts of the specification is made using the ASN.1 field or type identifier of the referenced element. The ASN.1 field and type identifiers used in text references should be in the *italic font style*. The "do not check spelling and grammar" attribute in Word should be set. Quotation marks (i.e., " ") should not be used around the ASN.1 field or type identifier.

A reference to an RRC PDU type should be made using the corresponding ASN.1 type identifier followed by the word "message", e.g., a reference to the *RRCConnectionRelease* message.

A reference to a specific part of an RRC PDU, or to a specific part of any other ASN.1 type, should be made using the corresponding ASN.1 field identifier followed by the word "field", e.g., a reference to the *prioritisedBitRate* field in the example below.

```
-- /example/ ASN1START

LogicalChannelConfig ::=            SEQUENCE {
    ul-SpecificParameters               SEQUENCE {
        priority                            Priority,
        prioritisedBitRate                  PrioritisedBitRate,
        bucketSizeDuration                  BucketSizeDuration,
        logicalChannelGroup                 INTEGER (0..3)
    }       OPTIONAL
}

-- ASN1STOP
```

NOTE: All the ASN.1 start tags in the ASN.1 sections, used as examples in this annex to the specification, are deliberately distorted, in order not to include them when the ASN.1 description of the RRC PDU contents is extracted from the specification.

A reference to a specific type of information element should be made using the corresponding ASN.1 type identifier preceded by the acronym "IE", e.g., a reference to the IE *LogicalChannelConfig* in the example above.

References to a specific type of information element should only be used when those are generic, i.e., without regard to the particular context wherein the specific type of information element is used. If the reference is related to a particular context, e.g., an RRC PDU type (message) wherein the information element is used, the corresponding field identifier in that context should be used in the text reference.

A reference to a specific value of an ASN.1 field should be made using the corresponding ASN.1 value while using quotation marks (i.e., " ") around the ASN.1 value, e.g., 'if the *status* field is set to value "*true*"'.

A.3.2 High-level message structure

Within each logical channel type, the associated RRC PDU (message) types are alternatives within a CHOICE, as shown in the example below.

```
-- /example/ ASN1START

DL-DCCH-Message ::= SEQUENCE {
    message                 DL-DCCH-MessageType
}

DL-DCCH-MessageType ::= CHOICE {
    c1                          CHOICE {
        dlInformationTransfer                   DLInformationTransfer,
        handoverFromEUTRAPreparationRequest     HandoverFromEUTRAPreparationRequest,
        mobilityFromEUTRACommand                MobilityFromEUTRACommand,
        rrcConnectionReconfiguration            RRCConnectionReconfiguration,
        rrcConnectionRelease                    RRCConnectionRelease,
        securityModeCommand                     SecurityModeCommand,
        ueCapabilityEnquiry                     UECapabilityEnquiry,
        spare1 NULL
    },
    messageClassExtension   SEQUENCE {}
}

-- ASN1STOP
```

A nested two-level CHOICE structure is used, where the alternative PDU types are alternatives within the inner level *c1* CHOICE.

Spare alternatives (i.e., *spare1* in this case) may be included within the *c1* CHOICE to facilitate future extension. The number of such spare alternatives should not extend the total number of alternatives beyond an integer-power-of-two number of alternatives (i.e., eight in this case).

Further extension of the number of alternative PDU types is facilitated using the *messageClassExtension* alternative in the outer level CHOICE.

A.3.3 Message definition

Each PDU (message) type is specified in an ASN.1 section similar to the one shown in the example below.

```
-- /example/ ASN1START

RRCConnectionReconfiguration ::=     SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            rrcConnectionReconfiguration-r8     RRCConnectionReconfiguration-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
    -- Enter the IEs here.
    ...
}

-- ASN1STOP
```

Hooks for *critical* and *non-critical* extension should normally be included in the PDU type specification. How these hooks are used is further described in sub-clause A.4.

Critical extensions are characterised by a redefinition of the PDU contents and need to be governed by a mechanism for protocol version agreement between the encoder and the decoder of the PDU, such that the encoder is prevented from sending a critically extended version of the PDU type, which is not comprehended by the decoder.

Critical extension of a PDU type is facilitated by a two-level CHOICE structure, where the alternative PDU contents are alternatives within the inner level *c1* CHOICE. Spare alternatives (i.e., *spare3* down to *spare1* in this case) may be included within the *c1* CHOICE. The number of spare alternatives to be included in the original PDU specification should be decided case by case, based on the expected rate of critical extension in the future releases of the protocol.

Further critical extension, when the spare alternatives from the original specifications are used up, is facilitated using the *criticalExtensionsFuture* in the outer level CHOICE.

In PDU types where critical extension is not expected in the future releases of the protocol, the inner level *c1* CHOICE and the spare alternatives may be excluded, as shown in the example below.

```
-- /example/ ASN1START

RRCConnectionReconfigurationComplete ::= SEQUENCE {
    rrc-TransactionIdentifier          RRC-TransactionIdentifier,
    criticalExtensions                 CHOICE {
        rrcConnectionReconfigurationComplete-r8
                                       RRCConnectionReconfigurationComplete-r8-IEs,
        criticalExtensionsFuture       SEQUENCE {}
    }
}

RRCConnectionReconfigurationComplete-r8-IEs ::= SEQUENCE {
    -- Enter the IEs here. --                                              -- Cond condTag
    ...
}

-- ASN1STOP
```

Non-critical extensions are characterised by the addition of new information to the original specification of the PDU type. If not comprehended, a non-critical extension may be skipped by the decoder, whilst the decoder is still able to complete the decoding of the comprehended parts of the PDU contents.

Non-critical extensions at locations other than the end of the message or other than at the end of a field contained in a BIT or OCTET STRING are facilitated by use of the ASN.1 extension marker "...". The original specification of a PDU type should normally include the extension marker at the end of the sequence of information elements contained.

Non-critical extensions at the end of the message or at the end of a field that is contained in a BIT or OCTET STRING are facilitated by use of an empty sequence that is marked OPTIONAL e.g. as shown in the following example:

```
-- /example/ ASN1START

RRCMessage-r8-IEs ::=                    SEQUENCE {
    field1                               InformationElement1,
    field2                               InformationElement2,
    nonCriticalExtension                 SEQUENCE {}                OPTIONAL    -- Need OP
}

-- ASN1STOP
```

The ASN.1 section specifying the contents of a PDU type may be followed by a *field description* table where a further description of, e.g., the semantic properties of the fields may be included. The general format of this table is shown in the example below. The field description table is absent in case there are no fields for which further description needs to be provided e.g. because the PDU does not include any fields, or because an IE is defined for each field while there is nothing specific regarding the use of this IE that needs to be specified.

%PDU-TypeIdentifier% **field descriptions**
%field identifier%
Field description.
%field identifier%
Field description.

The field description table has one column. The header row shall contain the ASN.1 type identifier of the PDU type.

The following rows are used to provide field descriptions. Each row shall include a first paragraph with a *field identifier* (in **bold and italic** font style) referring to the part of the PDU to which it applies. The following paragraphs at the same row may include (in regular font style), e.g., semantic description, references to other specifications and/ or specification of value units, which are relevant for the particular part of the PDU.

The parts of the PDU contents that do not require a field description shall be omitted from the field description table.

A.3.4   Information elements

Each IE (information element) type is specified in an ASN.1 section similar to the one shown in the example below.

```
-- /example/ ASN1START

PRACH-ConfigSIB ::=                 SEQUENCE {
    rootSequenceIndex                   INTEGER (0..1023),
    prach-ConfigInfo                    PRACH-ConfigInfo
}

PRACH-Config ::=                    SEQUENCE {
    rootSequenceIndex                   INTEGER (0..1023),
    prach-ConfigInfo                    PRACH-ConfigInfo                      OPTIONAL    -- Need ON
}

PRACH-ConfigInfo ::=                SEQUENCE {
    prach-ConfigIndex                   ENUMERATED {ffs},
    highSpeedFlag                       ENUMERATED {ffs},
    zeroCorrelationZoneConfig           ENUMERATED {ffs}
}

-- ASN1STOP
```

IEs should be introduced whenever there are multiple fields for which the same set of values apply. IEs may also be defined for other reasons e.g. to break down a ASN.1 definition in to smaller pieces.

A group of closely related IE type definitions, like the IEs *PRACH-ConfigSIB* and *PRACH-Config* in this example, are preferably placed together in a common ASN.1 section. The IE type identifiers should in this case have a common base, defined as the *generic type identifier*. It may be complemented by a suffix to distinguish the different variants. The "*PRACH-Config*" is the generic type identifier in this example, and the "*SIB*" suffix is added to distinguish the variant. The sub-clause heading and generic references to a group of closely related IEs defined in this way should use the generic type identifier.

The same principle should apply if a new version, or an extension version, of an existing IE is created for *critical* or *non-critical* extension of the protocol (see sub-clause A.4). The new version, or the extension version, of the IE is included in the same ASN.1 section defining the original. A suffix is added to the type identifier, using the naming conventions defined in sub-clause A.3.1.2, indicating the release or version of the where the new version, or extension version, was introduced.

Local IE type definitions, like the IE *PRACH-ConfigInfo* in the example above, may be included in the ASN.1 section and be referenced in the other IE types defined in the same ASN.1 section. The use of locally defined IE types should be encouraged, as a tool to break up large and complex IE type definitions. It can improve the readability of the code. There may also be a benefit for the software implementation of the protocol end-points, as these IE types are typically provided by the ASN.1 compiler as independent data elements, to be used in the software implementation.

An IE type defined in a local context, like the IE *PRACH-ConfigInfo*, should not be referenced directly from other ASN.1 sections in the RRC specification. An IE type which is referenced in more than one ASN.1 section should be defined in a separate sub-clause, with a separate heading and a separate ASN.1 section (possibly as one in a set of closely related IE types, like the IEs *PRACH-ConfigSIB* and *PRACH-Config* in the example above). Such IE types are also referred to as 'global IEs'.

NOTE: Referring to an IE type, that is defined as a local IE type in the context of another ASN.1 section, does not generate an ASN.1 compilation error. Nevertheless, using a locally defined IE type in that way makes the IE type definition difficult to find, as it would not be visible at an outline level of the specification. It should be avoided.

The ASN.1 section specifying the contents of one or more IE types, like in the example above, may be followed by a *field description* table, where a further description of, e.g., the semantic properties of the fields of the information

elements may be included. This table may be absent, similar as indicated in sub-clause A.3.3 for the specification of the PDU type. The general format of the *field description* table is the same as shown in sub-clause A.3.3 for the specification of the PDU type.

A.3.5   Fields with optional presence

A field with optional presence may be declared with the keyword DEFAULT. It identifies a default value to be assumed, if the sender does not include a value for that field in the encoding:

```
-- /example/ ASN1START

PreambleInfo ::=                     SEQUENCE {
    numberOfRA-Preambles             INTEGER (1..64)                     DEFAULT 1,
    ...
}

-- ASN1STOP
```

Alternatively, a field with optional presence may be declared with the keyword OPTIONAL. It identifies a field for which a value can be omitted. The omission carries semantics, which is different from any normal value of the field:

```
-- /example/ ASN1START

PRACH-Config ::=                SEQUENCE {
    rootSequenceIndex                INTEGER (0..1023),
    prach-ConfigInfo                 PRACH-ConfigInfo                    OPTIONAL     -- Need ON
}

-- ASN1STOP
```

The semantics of an optionally present field, in the case it is omitted, should be indicated at the end of the paragraph including the keyword OPTIONAL, using a short comment text with a need statement. The need statement includes the keyword "Need", followed by one of the predefined semantics tags (OP, ON or OR) defined in sub-clause 6.1. If the semantics tag OP is used, the semantics of the absent field are further specified either in the field description table following the ASN.1 section, or in procedure text.

A.3.6   Fields with conditional presence

A field with conditional presence is declared with the keyword OPTIONAL. In addition, a short comment text shall be included at the end of the paragraph including the keyword OPTIONAL. The comment text includes the keyword "Cond", followed by a condition tag associated with the field ("UL" in this example):

```
-- /example/ ASN1START

LogicalChannelConfig ::=            SEQUENCE {
    ul-SpecificParameters               SEQUENCE {
        priority                        INTEGER (0),
        ...
    }       OPTIONAL                                                             -- Cond UL
}

-- ASN1STOP
```

When conditionally present fields are included in an ASN.1 section, the field description table after the ASN.1 section shall be followed by a *conditional presence* table. The conditional presence table specifies the conditions for including the fields with conditional presence in the particular ASN.1 section.

Conditional presence	Explanation
UL	**Specification of the conditions for including the field associated with the condition tag = "UL". Semantics in case of optional presence under certain conditions may also be specified.**

The conditional presence table has two columns. The first column (heading: "Conditional presence") contains the condition tag (in *italic* font style), which links the fields with a condition tag in the ASN.1 section to an entry in the

table. The second column (heading: "Explanation") contains a text specification of the conditions and requirements for the presence of the field. The second column may also include semantics, in case of an optional presence of the field, under certain conditions i.e. using the same predefined tags as defined for optional fields in A.3.5.

If the ASN.1 section does not include any fields with conditional presence, the conditional presence table shall not be included.

Whenever a field is only applicable in specific cases e.g. TDD, use of conditional presence should be considered.

A.3.7 Guidelines on use of lists with elements of SEQUENCE type

Where an information element has the form of a list (the SEQUENCE OF construct in ASN.1) with the type of the list elements being a SEQUENCE data type, an information element shall be defined for the list elements even if it would not otherwise be needed.

For example, a list of PLMN identities with reservation flags is defined as in the following example:

```
-- /example/ ASN1START

PLMN-IdentityInfoList ::=          SEQUENCE (SIZE (1..6)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::=              SEQUENCE {
    plmn-Identity                     PLMN-Identity,
    cellReservedForOperatorUse        ENUMERATED {reserved, notReserved}
}

-- ASN1STOP
```

rather than as in the following (bad) example, which may cause generated code to contain types with unpredictable names:

```
-- /bad example/ ASN1START

PLMN-IdentityList ::=               SEQUENCE (SIZE (1..6)) OF SEQUENCE {
    plmn-Identity                     PLMN-Identity,
    cellReservedForOperatorUse        ENUMERATED {reserved, notReserved}
}

-- ASN1STOP
```

A.4 Extension of the PDU specifications

A.4.1 General principles to ensure compatibility

It is essential that extension of the protocol does not affect interoperability i.e. it is essential that implementations based on different versions of the RRC protocol are able to interoperate. In particular, this requirement applies for the following kind of protocol extensions:

- Introduction of new PDU types (i.e. these should not cause unexpected behaviour or damage).

- Introduction of additional fields in an extensible PDUs (i.e. it should be possible to ignore uncomprehended extensions without affecting the handling of the other parts of the message).

- Introduction of additional values of an extensible field of PDUs. If used, the behaviour upon reception of an uncomprehended value should be defined.

It should be noted that the PDU extension mechanism may depend on the logical channel used to transfer the message e.g. for some PDUs an implementation may be aware of the protocol version of the peer in which case selective ignoring of extensions may not be required.

The non-critical extension mechanism is the primary mechanism for introducing protocol extensions i.e. the critical extension mechanism is used merely when there is a need to introduce a 'clean' message version. Such a need appears when the last message version includes a large number of non-critical extensions, which results in issues like readability, overhead associated with the extension markers. The critical extension mechanism may also be considered when it is complicated to accomodate the extensions by means of non-critical extension mechanisms.

A.4.2   Critical extension of messages

The mechanisms to critically extend a message are defined in A.3.3. There are both "outer branch" and "inner branch" mechanisms available. The "outer branch" consists of a CHOICE having the name *criticalExtensions*, with two values, *c1* and *criticalExtensionsFuture*. The *criticalExtensionsFuture* branch consists of an empty SEQUENCE, while the c1 branch contains the "inner branch" mechanism.

The "inner branch" structure is a CHOICE with values of the form "*MessageName-rX-IEs*" (e.g., "*RRCConnectionReconfiguration-r8-IEs*") or "*spareX*", with the spare values having type NULL. The "-rX-IEs" structures contain the *complete* structure of the message IEs for the appropriate release; i.e., the critical extension branch for the Rel-10 version of a message includes all Rel-8 and Rel-9 fields (that are not obviated in the later version), rather than containing only the additional Rel-10 fields.

The following guidelines may be used when deciding which mechanism to introduce for a particular message, i.e. only an 'outer branch', or an 'outer branch' in combination with an 'inner branch' including a certain number of spares:

- For certain messages, e.g. initial uplink messages, messages transmitted on a broadcast channel, critical extension may not be applicable.

- An outer branch may be sufficient for messages not including any fields.

- The number of spares within inner branch should reflect the likelihood that the message will be critically extended in future releases (since each release with a critical extension for the message consumes one of the spare values). The estimation of the critical extension likelihood may be based on the number, size and changeability of the fields included in the message.

- In messages where an inner branch extension mechanism is available, all spare values of the inner branch should be used before any critical extensions are added using the outer branch.

The following example illustrates the use of the critical extension mechanism by showing the ASN.1 of the original and of a later release

```
-- /example/ ASN1START                    -- Original release

RRCMessage ::=                            SEQUENCE {
    rrc-TransactionIdentifier                 RRC-TransactionIdentifier,
    criticalExtensions                    CHOICE {
        c1                                    CHOICE{
            rrcMessage-r8                         RRCMessage-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture              SEQUENCE {}
    }
}

-- ASN1STOP
```

```
-- /example/ ASN1START                    -- Later release

RRCMessage ::=                            SEQUENCE {
    rrc-TransactionIdentifier                 RRC-TransactionIdentifier,
    criticalExtensions                    CHOICE {
        c1                                    CHOICE{
            rrcMessage-r8                         RRCMessage-r8-IEs,
            rrcMessage-ra                         RRCMessage-ra-IEs,
            rrcMessage-rb                         RRCMessage-rb-IEs,
            rrcMessage-re                         RRCMessage-re-IEs
        },
        later                             CHOICE {
            c2                                    CHOICE{
                rrcMessage-rg                         RRCMessage-rg-IEs,
                spare7 NULL, spare6 NULL, spare5 NULL, spare4 NULL,
                spare3 NULL, spare2 NULL, spare1 NULL
            },
            criticalExtensionsFuture              SEQUENCE {}
        }
    }
}

-- ASN1STOP
```

A.4.3   Non-critical extension of messages

A.4.3.1   General principles

The mechanisms to extend a message in a non-critical manner are defined in A.3.3. W.r.t. the use of extension markers, the following additional guidelines apply:

- When further non-critical extensions are added to a message that has been critically extended, the inclusion of these non-critical extensions in earlier critical branches of the message should be avoided when possible.

- The extension marker ("…") is the primary non-critical extension mechanism that is used unless a length determinant is not required. Examples of cases where a length determinant is not required:

  - at the end of a message,

  - at the end of a structure contained in a BIT STRING or OCTET STRING

- When an extension marker is available, non-critical extensions are preferably placed at the location (e.g. the IE) where the concerned parameter belongs from a logical/ functional perspective (referred to as the '*default extension location*')

- It is desirable to aggregate extensions of the same release or version of the specification into a group, which should be placed at the lowest possible level.

- In specific cases it may be preferrable to place extensions elsewhere (referred to as the '*actual extension location*') e.g. when it is possible to aggregate several extensions in a group. In such a case, the group should be placed at the lowest suitable level in the message. <TBD: ref to seperate example>

- In case placement at the default extension location affects earlier critical branches of the message, locating the extension at a following higher level in the message should be considered.

- In case an extension is not placed at the default extension location, an IE should be defined. The IE's ASN.1 definition should be placed in the same ASN.1 section as the default extension location. In case there are intermediate levels in-between the actual and the default extension location, an IE may be defined for each level. <TBD: ref to seperate example>

A.4.3.2   Further guidelines

Further to the general principles defined in the previous section, the following additional guidelines apply regarding the use of extension markers:

- Extension markers within SEQUENCE

  - Extension markers are primarily, but not exclusively, introduced at the higher nesting levels

  - Extension markers are introduced for a SEQUENCE comprising several fields as well as for information elements whose extension would result in complex structures without it (e.g. re-introducing another list)

  - Extension markers are introduced to make it possible to maintain important information structures e.g. parameters relevant for one particular RAT

  - Extension markers are also used for size critical messages (i.e. messages on BCCH, PCCH and CCCH), although introduced somewhat more carefully

  - The extension fields introduced (or frozen) in a specific version of the specification are grouped together within a SEQUENCE type. The group may consist of a single field.

  - A suffix of the form "vXYZ-IEs" is used for the type identifier of the SEQUENCE type used to group extension fields.

  - Although the group as a whole is marked as OPTIONAL, a "Need" statement may not be provided. In case a need statement is not provided for the group, a "Need" statement is provided for all individual extension

fields within the group i.e. including for fields that are not marked as OPTIONAL. The latter is to clarify the action upon absence of the whole group.

- Extension markers within ENUMERATED

  - Spare values are used until the number of values reaches the next power of 2, while the extension marker caters for extension beyond that limit

  - A suffix of the form "vXYZ" is used for the identifier of each new value, e.g. "value-vXYZ".

- Extension markers within CHOICE:

  - Extension markers are introduced when extension is foreseen and when comprehension is not required by the receiver i.e. behaviour is defined for the case where the receiver cannot comprehend the extended value (e.g. ignoring an optional CHOICE field). It should be noted that defining the behaviour of a receiver upon receiving a not comprehended choice value is not required if the sender is aware whether or not the receiver supports the extended value.

  - A suffix of the form "vXYZ" is used for the identifier of each new choice value, e.g. "choice-vXYZ".

There are no additional guidelines w.r.t. the use of non-critical extensions at the end of a message/ of a field contained in an OCTET or BIT STRING.

A.4.3.3 Typical example of evolution of IE with *local* extensions

The following example illustrates the use of the extension marker for a number of elementary cases (sequence, enumerated, choice). The example also illustrates how the IE may be revised in case the critical extension mechanism is used.

NOTE In case there is a need to support further extensions of release n while the ASN.1 of release (n+1) has been frozen, without requiring the the release n receiver to support decoding of release (n+1) extensions, more advanced mechanisms are needed e.g. including multiple extension markers.

```
-- /example/ ASN1START

InformationElement1 ::=           SEQUENCE {
    field1                            ENUMERATED {
                                          value1, value2, value3, value4-v880,
                                          ..., value5-v960 },
    field2                            CHOICE {
        field2a                           BOOLEAN,
        field2b                           InformationElement2b,
        ...,
        field2c-v960                      InformationElement2c-r9
    },
    ...,
    informationElement1-v960          InformationElement1-v960-IEs   OPTIONAL,   -- Need ON
    informationElement1-v9a0          InformationElement1-v9a0-IEs   OPTIONAL
}

InformationElement1-v960-IEs ::=  SEQUENCE {
    field3-r9                         InformationElement3-r9                     -- Need OR
}

InformationElement1-v9a0-IEs ::=  SEQUENCE {
    field3-v9a0                       InformationElement3-v9a0       OPTIONAL,   -- Need OR
    field4-r9                         InformationElement4            OPTIONAL    -- Need OR
}

InformationElement1-r10 ::=       SEQUENCE {
    field1                            ENUMERATED {
                                          value1, value2, value3, value4-v880,
                                          value5-v960, value6-v1170, spare2, spare1, ... },
    field2                            CHOICE {
        field2a                           BOOLEAN,
        field2b                           InformationElement2b,
        field2c-v960                      InformationElement2c-r9,
        ...,
        field2d-v12b0                     INTEGER (0..63)
    },
    field3-r9                         InformationElement3-r10        OPTIONAL,   -- Need OR
    field4-r9                         InformationElement4            OPTIONAL,   -- Need OR
```

```
    field5-r10                      BOOLEAN,
    field6-r10                      InformationElement6-r10      OPTIONAL,   -- Need OR
    ...,
    informationElement1-v1170       InformationElement1-v1170-IEs  OPTIONAL
}

InformationElement1-v1170-IEs ::=   SEQUENCE {
    field3-v1170                    InformationElement3-v1170    OPTIONAL    -- Need OR
}


-- ASN1STOP
```

Some remarks regarding the extensions of *InformationElement1* as shown in the above example:

- The *InformationElement1* is initially extended with a number of non-critical extensions. In release 10 however, a critical extension is introduced for the message using this IE. Consequently, a new version of the IE *InformationElement1* (i.e. *InformationElement1-r10*) is defined in which the earlier non-critical extensions are incorporated by means of a revision of the original field.

- The *value4-v880* is replacing a spare value defined in the original protocol version for *field1*. Likewise *value6-v1170* replaces *spare3* that was originally defined in the r10 version of *field1*

- Within the critically extended release 10 version of *InformationElement1*, the names of the original fields/ IEs are not changed, unless there is a real need to distinguish them from other fields/ IEs. E.g. the *field1* and *InformationElement4* were defined in the original protocol version (release 8) and hence not tagged. Moreover, the *field3-r9* is introduced in release 9 and not re-tagged; although, the *InformationElement3* is also critically extended and therefore tagged *InformationElement3-r10* in the release 10 version of InformationElement1.

A.4.3.4   Typical examples of non critical extension at the end of a message

The following example illustrates the use of non-critical extensions at the end of the message or at the end of a field that is contained in a BIT or OCTET STRING i.e. when an empty sequence is used.

```
-- /example/ ASN1START

RRCMessage-r8-IEs ::=           SEQUENCE {
    field1                          InformationElement1,
    field2                          InformationElement2,
    field3                          InformationElement3          OPTIONAL,   -- Need ON
    nonCriticalExtension            RRCMessage-v860-IEs          OPTIONAL    -- Need OP
}

RRCMessage-v860-IEs ::=         SEQUENCE {
    field4-v860                     InformationElement4          OPTIONAL,   -- Need OP
    field5-v860                     BOOLEAN                      OPTIONAL,   -- Cond C54
    nonCriticalExtension            RRCMessage-v940-IEs          OPTIONAL    -- Need ON
}

RRCMessage-v940-IEs ::=         SEQUENCE {
    field6-v940                     InformationElement6-r9       OPTIONAL,   -- Need OR
    nonCriticalExtensions           SEQUENCE {}                  OPTIONAL    -- Need OP
}

-- ASN1STOP
```

Some remarks regarding the extensions shown in the above example:

- The *InformationElement4* is introduced in the original version of the protocol (release 8) and hence no suffix is used.

A.4.3.5   Examples of non-critical extensions not placed at the default extension location

The following example illustrates the use of non-critical extensions in case an extension is not placed at the default extension location.

–   *ParentIE-WithEM*

The IE *ParentIE-WithEM* is an example of a high level IE including the extension marker (EM). The root encoding of this IE includes two lower level IEs *ChildIE1-WithoutEM* and *ChildIE2-WithoutEM* which not include the extension marker. Consequently, non-critical extensions of the Child-IEs have to be included at the level of the Parent-IE.

The example illustrates how the two extension IEs *ChildIE1-WithoutEM-vNx0* and *ChildIE2-WithoutEM-vNx0* (both in release N) are used to connect non-critical extensions with a default extension location in the lower level IEs to the actual extension location in this IE.

ParentIE-WithEM information element

```
-- /example/ ASN1START

ParentIE-WithEM ::=               SEQUENCE {
    -- Root encoding, including:
    childIE1-WithoutEM            ChildIE1-WithoutEM         OPTIONAL,    -- Need ON
    childIE2-WithoutEM            ChildIE2-WithoutEM         OPTIONAL,    -- Need ON
    ...,
    parentIE-WithEM-vNx0          ParentIE-WithEM-vNx0-IEs   OPTIONAL     -- Need ON
}

ParentIE-WithEM-vNx0-IEs ::=      SEQUENCE {
    childIE1-WithoutEM-vNx0       ChildIE1-WithoutEM-vNx0    OPTIONAL,    -- Need ON
    childIE2-WithoutEM-vNx0       ChildIE2-WithoutEM-vNx0    OPTIONAL     -- Need ON
}

-- ASN1STOP
```

Some remarks regarding the extensions shown in the above example:

–   The the fields *childIEx-WithoutEM-vNx0* may not really need to be optional (depends on what is defined at the next lower level).

–   *ChildIE1-WithoutEM*

The IE *ChildIE1-WithoutEM* is an example of a lower level IE, used to control certain radio configurations including a configurable feature which can be setup or released using the local IE *ChIE1-ConfigurableFeature*. The example illustrates how the new field *chIE1-NewField* is added in release N to the configuration of the configurable feature. The example is based on the following assumptions:

–   when initially configuring as well as when modifying the new field, the original fields of the configurable feature have to be provided also i.e. as if the extended ones were present within the setup branch of this feature.

–   when the configurable feature is released, the new field should be released also.

–   when omitting the original fields of the configurable feature the UE continues using the existing values (which is used to optimise the signalling for features that typically continue unchanged upon handover).

–   when omitting the new field of the configurable feature the UE releases the existing values and discontinues the associated functionality (which may be used to support release of unsupported functionality upon handover to an eNB supporting an earlier protocol version).

The above assumptions, which affect the use of conditions and need codes, may not always apply. Hence, the example should not be re-used blindly.

ChildIE1-WithoutEM information elements

```
-- /example/ ASN1START

ChildIE1-WithoutEM ::=            SEQUENCE {
    -- Root encoding, including:
    chIE1-ConfigurableFeature     ChIE1-ConfigurableFeature  OPTIONAL       -- Need ON
}

ChildIE1-WithoutEM-vNx0 ::=       SEQUENCE {
```

```
    chIE1-ConfigurableFeature-vNx0    ChIE1-ConfigurableFeature-vNx0  OPTIONAL    -- Cond ConfigF
}

ChIE1-ConfigurableFeature ::=       CHOICE {
    release                         NULL,
    setup                           SEQUENCE {
        -- Root encoding
    }
}

ChIE1-ConfigurableFeature-vNx0 ::=  SEQUENCE {
    chIE1-NewField-rN               INTEGER (0..31)
}

-- ASN1STOP
```

Conditional presence	Explanation
ConfigF	The field is optional present, need OR, in case of *chIE1-ConfigurableFeature* is included and set to "setup"; otherwise the field is not present and the UE shall delete any existing value for this field.

– *ChildIE2-WithoutEM*

The IE *ChildIE2-WithoutEM* is an example of a lower level IE, typically used to control certain radio configurations. The example illustrates how the new field *chIE1-NewField* is added in release N to the configuration of the configurable feature.

ChildIE2-WithoutEM **information element**

```
-- /example/ ASN1START

ChildIE2-WithoutEM ::=              CHOICE {
    release                         NULL,
    setup                           SEQUENCE {
        -- Root encoding
    }
}

ChildIE2-WithoutEM-vNx0 ::=         SEQUENCE {
    chIE2-NewField-rN               INTEGER (0..31)                 OPTIONAL    -- Cond ConfigF
}

-- ASN1STOP
```

Conditional presence	Explanation
ConfigF	The field is optional present, need OR, in case of *chIE2-ConfigurableFeature* is included and set to "setup"; otherwise the field is not present and the UE shall delete any existing value for this field.

A.5 Guidelines regarding inclusion of transaction identifiers in RRC messages

The following rules provide guidance on which messages should include a Transaction identifier

1: DL messages on CCCH that move UE to RRC-Idle should not include the RRC transaction identifier.

2: All network initiated DL messages by default should include the RRC transaction identifier.

3: All UL messages that are direct response to a DL message with an RRC Transaction identifier should include the RRC Transaction identifier.

4: All UL messages that require a direct DL response message should include an RRC transaction identifier.

5: All UL messages that are not in response to a DL message nor require a corresponding response from the network should not include the RRC Transaction identifier.

A.6 Protection of RRC messages (informative)

The following list provides information which messages can be sent (unprotected) prior to security activation and which messages can be sent unprotected after security activation.

P…Messages that can be sent (unprotected) prior to security activation

A - I…Messages that can be sent without integrity protection after security activation

A - C…Messages that can be sent unciphered after security activation

NA… Message can never be sent after security activation

Message	P	A-I	A-C	Comment
CSFBParametersRequestCDMA2000	+	-	-	
CSFBParametersResponseCDMA2000	+	-	-	
CounterCheck	-	-	-	
CounterCheckResponse	-	-	-	
DLInformationTransfer	+	-	-	
HandoverFromEUTRAPreparationRequest (CDMA2000)	-	-	-	
MasterInformationBlock	+	+	+	
MeasurementReport	+	-	-	Justification for case "P": RAN2 agreed that measurement configuration may be sent prior to security activation
MobilityFromEUTRACommand	-	-	-	
Paging	+	+	+	
RRCConnectionReconfiguration	+	-	-	The message shall not be sent unprotected before security activation if it is used to perform handover or to establish SRB2 and DRBs
RRCConnectionReconfigurationComplete	+	-	-	Unprotected, if sent as response to RRCConnectionReconfiguration which was sent before security activation
RRCConnectionReestablishment	-	+	+	This message is not protected by PDCP operation.
RRCConnectionReestablishmentComplete	-	-	-	
RRCConnectionReestablishmentReject	-	+	+	One reason to send this may be that the security context has been lost, therefore sent as unprotected.
RRCConnectionReestablishmentRequest	-	-	+	This message is not protected by PDCP operation. However a short MAC-I is included.
RRCConnectionReject	+	NA	NA	
RRCConnectionRelease	+	-	-	Jusitification for P: If the RRC connection only for signalling not requiring DRBs or ciphered messages, or the signalling connection has to be released prematurily, this message is sent as unprotected.
RRCConnectionRequest	+	NA	NA	
RRCConnectionSetup	+	NA	NA	
RRCConnectionSetupComplete	+	NA	NA	
SecurityModeCommand	+	NA	NA	Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC)
SecurityModeComplete	-	NA	NA	Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure.
SecurityModeFailure	+	NA	NA	Neither integrity protection nor ciphering applied.
SystemInformation	+	+	+	
SystemInformationBlockType1	+	+	+	
UECapabilityEnquiry	+	-	-	
UECapabilityInformation	+	-	-	
ULHandoverPreparationTransfer (CDMA2000)	-	-	-	This message should follow HandoverFromEUTRAPreparationRequest
ULInformationTransfer	+	-	-	

A.7 Miscellaneous

The following miscellaneous conventions should be used:

- References: Whenever another specification is referenced, the specification number and optionally the relevant subclause, table or figure, should be indicated in addition to the pointer to the References section e.g. as follows: 'see TS 36.212 [22, 5.3.3.1.6]'.

Annex B (normative): Release 8 AS feature handling

B.1 Feature group indicators

This annex contains the definitions of the bits in field *featureGroupIndicators*.

In this release of the protocol, the UE shall include the field *featureGroupIndicators* in the IE *UE-EUTRA-Capability*. All the functionalities defined within the field *featureGroupIndicators* defined in Table B.1-1 are mandatory for the UE, if the related capability (frequency band, RAT or SR-VCC) is also supported. For a specific indicator, if all functionalities for a feature group listed in Table B.1-1 have been implemented and tested, the UE shall set the indicator as one (1), else (i.e. if any one of the functionalities in a feature group listed in Table B.1-1, which have not been implemented or tested), the UE shall set the indicator as zero (0).

The UE shall set all indicators, which do not have a definition in the table B.1-1, as zero.

If the optional field *featureGroupIndicators* is not included by UE supporting future release, the network may assume that UE supports all features listed in Table B.1-1 and deployed in the network.

Table B.1-1: Definitions of feature group indicators

Index of indicator (bit number)	Definition (description of the supported functionality, if indicator set to one)	Notes
1 (leftmost bit)	- Intra-subframe frequency hopping for PUSCH scheduled by UL grant - DCI format 3a (TPC commands for PUCCH and PUSCH with single bit power adjustments) - PDSCH transmission mode 5 - Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI - Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-2 – UE selected subband CQI with multiple PMI	
2	- Simultaneous CQI and ACK/NACK on PUCCH, i.e. PUCCH format 2a and 2b - Absolute TPC command for PUSCH - Resource allocation type 1 for PDSCH - Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-0 – UE selected subband CQI without PMI - Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-1 – UE selected subband CQI with single PMI	
3	- Semi-persistent scheduling - TTI bundling - 5bit RLC UM SN - 7bit PDCP SN	- can only be set to 1 if the UE has set bit number 7 to 1.
4	- Short DRX cycle	- can only be set to 1 if the UE has set bit number 5 to 1.

Index of indicator (bit number)	Definition (description of the supported functionality, if indicator set to one)	Notes
5	- Long DRX cycle - DRX command MAC control element	
6	- Prioritised bit rate	
7	- RLC UM	- can only be set to 0 if the UE does not support voice
8	- EUTRA RRC_CONNECTED to UTRA CELL_DCH PS handover	- can only be set to 1 if the UE has set bit number 22 to 1
9	- EUTRA RRC_CONNECTED to GERAN GSM_Dedicated handover	- related to SR-VCC - can only be set to 1 if the UE has set bit number 23 to 1
10	- EUTRA RRC_CONNECTED to GERAN (Packet_) Idle by Cell Change Order - EUTRA RRC_CONNECTED to GERAN (Packet_) Idle by Cell Change Order with NACC (Network Assisted Cell Change)	
11	- EUTRA RRC_CONNECTED to CDMA2000 1xRTT CS Active handover	- can only be set to 1 if the UE has sets bit number 24 to 1
12	- EUTRA RRC_CONNECTED to CDMA2000 HRPD Active handover	- can only be set to 1 if the UE has set bit number 26 to 1
13	- Inter-frequency handover (within FDD or TDD)	- can only be set to 1 if the UE has set bit number 25 to 1
14	- Measurement reporting event: Event A4 – Neighbour > threshold - Measurement reporting event: Event A5 – Serving < threshold1 & Neighbour > threshold2	
15	- Measurement reporting event: Event B1 – Neighbour > threshold for UTRAN, GERAN, 1xRTT or HRPD, if the UE has set bit number 22, 23, 24 or 26 to 1, respectively	- can only be set to 1 if the UE has set at least one of the bit number 22, 23, 24 or 26 to 1.
16	- Intra-frequency periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCells*; - Inter-frequency periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCells*, if the UE has set bit number 25 to 1; and - Inter-RAT periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCells* for UTRAN, GERAN, 1xRTT or HRPD, if the UE has set bit number 22, 23, 24 or 26 to 1, respectively. NOTE: Event triggered periodical reporting (i.e. with *triggerType* set to *event* and with *reportAmount* > 1) is a mandatory functionality of event triggered reporting and therefore not the subject of this bit.	
17	Intra-frequency ANR features including: - Intra-frequency periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCells* - Intra-frequency periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportCGI*	- can only be set to 1 if the UE has set bit number 5 to 1.
18	Inter-frequency ANR features including: - Inter-frequency periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCells* - Inter-frequency periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportCGI*	- can only be set to 1 if the UE has set bit number 5 and bit number 25 to 1.
19	Inter-RAT ANR features including: - Inter-RAT periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCells* for GERAN, if the UE has set bit number 23 to 1 - Inter-RAT periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportStrongestCellsForSON* for UTRAN, 1xRTT or HRPD, if the UE has set bit number 22, 24 or 26 to 1, respectively - Inter-RAT periodical measurement reporting where *triggerType* is set to *periodical* and *purpose* is set to *reportCGI* for UTRAN,	- can only be set to 1 if the UE has set bit number 5 to 1 and the UE has set at least one of the bit number 22, 23, 24 or 26 to 1.

Index of indicator (bit number)	Definition (description of the supported functionality, if indicator set to one)	Notes
	GERAN, 1xRTT or HRPD, if the UE has set bit number 22, 23, 24 or 26 to 1, respectively	
20	If bit number 7 is set to '0': - SRB1 and SRB2 for DCCH + 8x AM DRB If bit number 7 is set to '1': - SRB1 and SRB2 for DCCH + 8x AM DRB - SRB1 and SRB2 for DCCH + 5x AM DRB + 3x UM DRB NOTE: UE which indicate support for a DRB combination also support all subsets of the DRB combination. Therefore, release of DRB(s) never results in an unsupported DRB combination.	- Regardless of what bit number 7 and bit number 20 is set to, UE shall support at least SRB1 and SRB2 for DCCH + 4x AM DRB - Regardless of what bit number 20 is set to, if bit number 7 is set to '1', UE shall support at least SRB1 and SRB2 for DCCH + 4x AM DRB + 1x UM DRB
21	- Predefined intra- and inter-subframe frequency hopping for PUSCH with N_sb > 1 - Predefined inter-subframe frequency hopping for PUSCH with N_sb > 1	
22	- UTRAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode	
23	- GERAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode	
24	- 1xRTT measurements, reporting and measurement reporting event B2 in E-UTRA connected mode	
25	- Inter-frequency measurements and reporting in E-UTRA connected mode NOTE: The UE setting this bit to 1 and indicating support for FDD and TDD frequency bands in the UE capability signalling implements and is tested for FDD measurements while the UE is in TDD, and for TDD measurements while the UE is in FDD.	
26	- HRPD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode	
27	- EUTRA RRC_CONNECTED to UTRA CELL_DCH CS handover	- related to SR-VCC - can only be set to 1 if the UE has set bit number 8 to 1
28	Undefined	
29	Undefined	
30	- Handover between FDD and TDD	- can only be set to 1 if the UE has set bit number 13 to 1 - In this release of the protocol, this bit will never be mandated to be set to 1
31	Undefined	
32	Undefined	

Clarification for mobility from EUTRAN and inter-frequency handover within EUTRAN

There are several feature groups related to mobility from E-UTRAN and inter-frequency handover within EUTRAN. The description of these features is based on the assumption that we have 5 main "functions" related to mobility from E-UTRAN:

A. Support of measurements and cell reselection procedure in idle mode

B. Support of RRC release with redirection procedure in connected mode

C. Support of Network Assisted Cell Change in connected mode

D. Support of measurements and reporting in connected mode

E. Support of handover procedure in connected mode

All functions can be applied for mobility to Inter-frequency to EUTRAN, GERAN, UTRAN, CDMA2000 HRPD and CDMA2000 1xRTT except for function C) which is only applicable for mobility to GERAN. Table B.1-2 below

summarises the mobility functions that are supported based on the UE capability signaling (band support) and the setting of the feature group support indicators.

Table B.1-2: Mobility from E-UTRAN

Feature	GERAN	UTRAN	HRPD	1xRTT	EUTRAN
A. Measurements and cell reselection procedure in E-UTRA idle mode	Supported if GERAN band support is indicated	Supported if UTRAN band support is indicated	Supported if CDMA2000 HRPD band support is indicated	Supported if CDMA2000 1xRTT band support is indicated	Supported for supported bands
B. RRC release with blind redirection procedure in E-UTRA connected mode	Supported if GERAN band support is indicated	Supported if UTRAN band support is indicated	Supported if CDMA2000 HRPD band support is indicated	Supported if CDMA2000 1xRTT band support is indicated	Supported for supported bands
C. Cell Change Order (with or without) Network Assisted Cell Change) in E-UTRA connected mode	Group 10	N.A.	N.A	N.A	N.A.
D. Inter-frequency/RAT measurements, reporting and measurement reporting event B2 (for inter-RAT) in E-UTRA connected mode	Group 23	Group 22	Group 26	Group 24	Group 25
E. Inter-frequency/RAT handover procedure in E-UTRA connected mode	Group 9 (GSM_connected handover) Separate UE capability bit defined in TS 36.306 for PS handover	Group 8 (PS handover) or Group 27 (SRVCC handover)	Group 12	Group 11	Group 13 (within FDD o TDD) Group 30 (between FDD and TDD)

In case measurements and reporting function is not supported by the UE, the network may still issue the mobility procedures redirection (B) and CCO (C) in a blind fashion.

B.2 CSG support

In this release of the protocol, it is mandatory for the UE to support a minimum set of CSG functionality consisting of:

- Identifying whether a cell is CSG or not;

- Ignoring CSG cells in cell selection/reselection.

Additional CSG functionality in AS, i.e. the requirement to detect and camp on CSG cells when the "allowed CSG list" is available or when manual CSG selection is triggered by the user, are related to the corresponding NAS features. This additional AS functionality consists of:

- Manual CSG selection;

- Autonomous CSG search;

- Implicit priority handling for cell reselection with CSG cells.

It is possible that this additional CSG functionality in AS is not supported or tested in early UE implementations.

Note that since the above AS features relate to idle mode operations, the capability support is not signalled to the network. For these reasons, no "feature group indicator" is assigned to this feature to indicate early support in Rel-8.

Annex C (informative):
Change history

					Change history		
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
12/2007	RP-38	RP-070920	-		Approved at TSG-RAN #38 and placed under Change Control	1.0.0	8.0.0
03/2008	RP-39	RP-080163	0001	4	CR to 36.331 with Miscellaneous corrections	8.0.0	8.1.0
03/2008	RP-39	RP-080164	0002	2	CR to 36.331 to convert RRC to agreed ASN.1 format	8.0.0	8.1.0
05/2008	RP-40	RP-080361	0003	1	CR to 36.331 on Miscellaneous clarifications/ corrections	8.1.0	8.2.0
09/2008	RP-41	RP-080693	0005	-	CR on Miscellaneous corrections and clarifications	8.2.0	8.3.0
12/2008	RP-42	RP-081021	0006	-	Miscellaneous corrections and clarifications	8.3.0	8.4.0
03/2009	RP-43	RP-090131	0007	-	Correction to the Counter Check procedure	8.4.0	8.5.0
	RP-43	RP-090131	0008	-	CR to 36.331-UE Actions on Receiving SIB11	8.4.0	8.5.0
	RP-43	RP-090131	0009	1	Spare usage on BCCH	8.4.0	8.5.0
	RP-43	RP-090131	0010	-	Issues in handling optional IE upon absence in GERAN NCL	8.4.0	8.5.0
	RP-43	RP-090131	0011	-	CR to 36.331 on Removal of useless RLC re-establishment at RB release	8.4.0	8.5.0
	RP-43	RP-090131	0012	1	Clarification to RRC level padding at PCCH and BCCH	8.4.0	8.5.0
	RP-43	RP-090131	0013	-	Removal of Inter-RAT message	8.4.0	8.5.0
	RP-43	RP-090131	0014	-	Padding of the SRB-ID for security input	8.4.0	8.5.0
	RP-43	RP-090131	0015	-	Validity of ETWS SIB	8.4.0	8.5.0
	RP-43	RP-090131	0016	1	Configuration of the Two-Intervals-SPS	8.4.0	8.5.0
	RP-43	RP-090131	0017	-	Corrections on Scaling Factor Values of Qhyst	8.4.0	8.5.0
	RP-43	RP-090131	0018	1	Optionality of srsMaxUppts	8.4.0	8.5.0
	RP-43	RP-090131	0019	-	CR for discussion on field name for common and dedicated IE	8.4.0	8.5.0
	RP-43	RP-090131	0020	-	Corrections to Connected mode mobility	8.4.0	8.5.0
	RP-43	RP-090131	0021	-	Clarification regarding the measurement reporting procedure	8.4.0	8.5.0
	RP-43	RP-090131	0022	1	Corrections on s-Measure	8.4.0	8.5.0
	RP-43	RP-090131	0023	1	R1 of CR0023 (R2-091029) on combination of SPS and TTI bundling for TDD	8.4.0	8.5.0
	RP-43	RP-090131	0024	-	L3 filtering for path loss measurements	8.4.0	8.5.0
	RP-43	RP-090131	0025	1	S-measure handling for reportCGI	8.4.0	8.5.0
	RP-43	RP-090131	0026	1	Measurement configuration clean up	8.4.0	8.5.0
	RP-43	RP-090131	0027	-	Alignment of measurement quantities for UTRA	8.4.0	8.5.0
	RP-43	RP-090131	0028	-	CR to 36.331 on L1 parameters ranges alignment	8.4.0	8.5.0
	RP-43	RP-090131	0029	-	Default configuration for transmissionMode	8.4.0	8.5.0
	RP-43	RP-090131	0030	-	CR to 36.331 on RRC Parameters for MAC, RLC and PDCP	8.4.0	8.5.0
	RP-43	RP-090131	0031	1	CR to 36.331 - Clarification on Configured PRACH Freq Offset	8.4.0	8.5.0
	RP-43	RP-090131	0032	-	Clarification on TTI bundling configuration	8.4.0	8.5.0
	RP-43	RP-090131	0033	1	Update of R2-091039 on Inter-RAT UE Capability	8.4.0	8.5.0
	RP-43	RP-090133	0034	-	Feature Group Support Indicators	8.4.0	8.5.0
	RP-43	RP-090131	0036	-	Corrections to RLF detection	8.4.0	8.5.0
	RP-43	RP-090131	0037	-	Indication of Dedicated Priority	8.4.0	8.5.0
	RP-43	RP-090131	0038	2	Security Clean up	8.4.0	8.5.0
	RP-43	RP-090131	0039	-	Correction of TTT value range	8.4.0	8.5.0
	RP-43	RP-090131	0040	-	Correction on CDMA measurement result IE	8.4.0	8.5.0
	RP-43	RP-090131	0041	1	Clarification of Measurement Reporting	8.4.0	8.5.0
	RP-43	RP-090131	0042	-	Spare values in DL and UL Bandwidth in MIB and SIB2	8.4.0	8.5.0
	RP-43	RP-090131	0044	1	Clarifications to System Information Block Type 8	8.4.0	8.5.0
	RP-43	RP-090131	0045	-	Reception of ETWS secondary notification	8.4.0	8.5.0
	RP-43	RP-090131	0046	1	Validity time for ETWS message Id and Sequence No	8.4.0	8.5.0
	RP-43	RP-090131	0047	-	CR for Timers and constants values used during handover to E-UTRA	8.4.0	8.5.0
	RP-43	RP-090131	0048	-	Inter-RAT Security Clarification	8.4.0	8.5.0
	RP-43	RP-090131	0049	-	CR to 36.331 on consistent naming of 1xRTT identifiers	8.4.0	8.5.0
	RP-43	RP-090131	0050	-	Capturing RRC behavior regarding NAS local release	8.4.0	8.5.0
	RP-43	RP-090131	0051	-	Report CGI before T321 expiry and UE null reporting	8.4.0	8.5.0
	RP-43	RP-090131	0052	-	System Information and 3 hour validity	8.4.0	8.5.0
	RP-43	RP-090131	0053	1	Inter-Node AS Signalling	8.4.0	8.5.0
	RP-43	RP-090131	0054	-	Set of values for the parameter "messagePowerOffsetGroupB"	8.4.0	8.5.0
	RP-43	RP-090131	0055	-	CR to paging reception for ETWS capable UEs in RRC_CONNECTED	8.4.0	8.5.0
	RP-43	RP-090131	0056	1	CR for CSG related items in 36.331	8.4.0	8.5.0
	RP-43	RP-090131	0057	1	SRS common configuration	8.4.0	8.5.0
	RP-43	RP-090131	0058	-	RRC processing delay	8.4.0	8.5.0
	RP-43	RP-090131	0059	-	CR for HNB Name	8.4.0	8.5.0
	RP-43	RP-090131	0060	3	Handover to EUTRA delta configuration	8.4.0	8.5.0
	RP-43	RP-090131	0063	-	Delivery of Message Identifier and Serial Number to upper layers for ETWS	8.4.0	8.5.0
	RP-43	RP-090131	0066	-	Clarification on the maximum size of cell lists	8.4.0	8.5.0

	RP-43	RP-090131	0067	-	Missing RRC messages in 'Protection of RRC messages'	8.4.0	8.5.0
	RP-43	RP-090131	0069	1	Clarification on NAS Security Container	8.4.0	8.5.0
	RP-43	RP-090131	0071	-	Extension of range of CQI/PMI configuration index	8.4.0	8.5.0
	RP-43	RP-090131	0072	1	Access barring alleviation in RRC connection establishment	8.4.0	8.5.0
	RP-43	RP-090367	0077	6	Corrections to feature group support indicators	8.4.0	8.5.0
	RP-43	RP-090131	0078	-	CR from email discussion to capture DRX and TTT handling	8.4.0	8.5.0
	RP-43	RP-090131	0079	1	Need Code handling on BCCH messages	8.4.0	8.5.0
	RP-43	RP-090131	0080	-	Unification of T300 and T301 and removal of miscallaneous FFSs	8.4.0	8.5.0
	RP-43	RP-090131	0084	1	Proposed CR modifying the code-point definitions of neighbourCellConfiguration	8.4.0	8.5.0
	RP-43	RP-090131	0087	2	Remove Redundant Optionality in SIB8	8.4.0	8.5.0
	RP-43	RP-090131	0089	-	Corrections to the generic error handling	8.4.0	8.5.0
	RP-43	RP-090131	0090	-	Configurability of T301	8.4.0	8.5.0
	RP-43	RP-090131	0091	1	Correction related to TTT	8.4.0	8.5.0
	RP-43	RP-090131	0095	-	CR for 36.331 on SPS-config	8.4.0	8.5.0
	RP-43	RP-090131	0096	2	CR for Deactivation of periodical measurement	8.4.0	8.5.0
	RP-43	RP-090131	0099	2	SMC and reconfiguration	8.4.0	8.5.0
	RP-43	RP-090131	0101	-	TDD handover	8.4.0	8.5.0
	RP-43	RP-090131	0102	-	Corrections to system information acquisition	8.4.0	8.5.0
	RP-43	RP-090131	0106	-	Some Corrections and Clarifications to 36.331	8.4.0	8.5.0
	RP-43	RP-090131	0109	-	Clarification on the Maximum number of ROHC context sessions parameter	8.4.0	8.5.0
	RP-43	RP-090131	0110	-	Transmission of rrm-Config at Inter-RAT Handover	8.4.0	8.5.0
	RP-43	RP-090131	0111	1	Use of SameRefSignalsInNeighbor parameter	8.4.0	8.5.0
	RP-43	RP-090131	0112	-	Default serving cell offset for measurement event A3	8.4.0	8.5.0
	RP-43	RP-090131	0114	-	dl-EARFCN missing in HandoverPreparationInformation	8.4.0	8.5.0
	RP-43	RP-090131	0115	-	Cleanup of references to 36.101	8.4.0	8.5.0
	RP-43	RP-090131	0117	-	Correction to the value range of UE-Categories	8.4.0	8.5.0
	RP-43	RP-090131	0122	1	Correction on RRC connection re-establishment	8.4.0	8.5.0
	RP-43	RP-090131	0124	-	Performing Measurements to report CGI for CDMA2000	8.4.0	8.5.0
	RP-43	RP-090131	0125	-	CDMA2000-SystemTimeInfo in VarMeasurementConfiguration	8.4.0	8.5.0
	RP-43	RP-090131	0126	-	UE Capability Information for CDMA2000 1xRTT	8.4.0	8.5.0
	RP-43	RP-090131	0127	-	CDMA2000 related editorial changes	8.4.0	8.5.0
	RP-43	RP-090131	0128	-	Draft CR to 36.331 on State mismatch recovery at re-establishment	8.4.0	8.5.0
	RP-43	RP-090131	0129	1	Draft CR to 36.331 on Renaming of AC barring related IEs	8.4.0	8.5.0
	RP-43	RP-090131	0130	2	Draft CR to 36.331 on Inheriting of dedicated priorities at inter-RAT reselection	8.4.0	8.5.0
	RP-43	RP-090131	0135	-	Proposed CR to 36.331 Description alignment for paging parameter, nB	8.4.0	8.5.0
	RP-43	RP-090131	0139	2	Miscellaneous corrections and clarifications resulting from ASN.1 review	8.4.0	8.5.0
	RP-43	RP-090131	0141	1	Correction regarding Redirection Information fo GERAN	8.4.0	8.5.0
	RP-43	RP-090131	0142	-	Further ASN.1 review related issues	8.4.0	8.5.0
	RP-43	RP-090131	0143	-	Periodic measurements	8.4.0	8.5.0
	RP-43	RP-090131	0144	1	Further analysis on code point "OFF" for ri-ConfigIndex	8.4.0	8.5.0
	RP-43	RP-090131	0145	1	Adding and deleting same measurement or configuration in one message	8.4.0	8.5.0
	RP-43	RP-090131	0147	-	Corrections to IE dataCodingScheme in SIB11	8.4.0	8.5.0
	RP-43	RP-090131	0148	-	Clarification on Mobility from E-UTRA	8.4.0	8.5.0
	RP-43	RP-090131	0149	-	36.331 CR related to "not applicable"	8.4.0	8.5.0
	RP-43	RP-090131	0150	1	UE radio capability transfer	8.4.0	8.5.0
	RP-43	RP-090131	0151	-	CR to 36.331 on value of CDMA band classes	8.4.0	8.5.0
	RP-43	RP-090131	0152	-	Corrections to DRB modification	8.4.0	8.5.0
	RP-43	RP-090131	0153	-	Correction to presence condition for pdcp-config	8.4.0	8.5.0
	RP-43	RP-090131	0155	-	TDD HARQ-ACK feedback mode	8.4.0	8.5.0
	RP-43	RP-090275	0157	-	Corrections regarding use of carrierFreq for CDMA (SIB8) and GERAN (measObject)	8.4.0	8.5.0
	RP-43	RP-090321	0156	1	Sending of GERAN SI/PSI information at Inter-RAT Handover	8.4.0	8.5.0
	RP-43	RP-090339	0158	-	Clarification of CSG support	8.4.0	8.5.0
06/2009	RP-44	RP-090516	0159	-	Octet alignment of VarShortMAC-Input	8.5.0	8.6.0
	RP-44	RP-090516	0160	3	Minor corrections to the feature grouping	8.5.0	8.6.0
	RP-44	RP-090516	0161	-	Security clarification	8.5.0	8.6.0
	RP-44	RP-090516	0162	1	Sending of GERAN SI/PSI information at Inter-RAT Handover	8.5.0	8.6.0
	RP-44	RP-090516	0163	1	Correction of UE measurement model	8.5.0	8.6.07
	RP-44	RP-090516	0164	-	Restricting the reconfiguration of UM RLC SN field size	8.5.0	8.6.0
	RP-44	RP-090516	0165	1	36.331 CR on Clarification on cell change order from GERAN to E-UTRAN	8.5.0	8.6.0

	RP-44	RP-090516	0166	-	36.331 CR - Handling of expired TAT and failed D-SR	8.5.0	8.6.0
	RP-44	RP-090516	0167	1	Proposed CR to 36.331 Clarification on mandatory information in AS-Config	8.5.0	8.6.0
	RP-44	RP-090516	0168	2	Miscellaneous small corrections	8.5.0	8.6.0
	RP-44	RP-090516	0173	-	Clarification on the basis of delta signalling	8.5.0	8.6.0
	RP-44	RP-090516	0177	-	CR on Alignment of CCCH and DCCH handling of missing mandatory field	8.5.0	8.6.0
	RP-44	RP-090516	0180	2	Handling of Measurement Context During HO Preparation	8.5.0	8.6.0
	RP-44	RP-090516	0181	-	Clarification of key-eNodeB-Star in AdditionalReestabInfo	8.5.0	8.6.0
	RP-44	RP-090516	0182	1	UE Capability Transfer	8.5.0	8.6.0
	RP-44	RP-090516	0186	1	Clarification regarding mobility from E-UTRA in-between SMC and SRB2/DRB setup	8.5.0	8.6.0
	RP-44	RP-090516	0188	1	Correction and completion of specification conventions	8.5.0	8.6.0
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	RP-44	RP-090516	0199	-	Removing use of *defaultValue* for *mac-MainConfig*	8.5.0	8.6.0
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	RP-50	RP-101197	0506	-	Clarification regarding default configuration value N/A	8.11.0	8.12.0
	RP-50	RP-101197	0523	-	Restriction of AC barring parameter setting	8.11.0	8.12.0
03/2011	RP-51	RP-110265	0585	-	Clarification of band indicator in handover from E-UTRAN to GERAN	8.12.0	8.13.0
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	RP-52	RP-110828	0691	1	Correction for SR-VCC and QCI usage	8.13.0	8.14.0
	RP-52	RP-110828	0698	1	Introduction of UE capability for handover between FDD and TDD	8.13.0	8.14.0
09/2011	RP-53	RP-111272	0808	-	GERAN SI format for cell change order&PS handover to GERAN	8.14.0	8.15.0
12/2011	RP-54	RP-111706	0824	-	Clarification on SPS intervals	8.15.0	8.16.0

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	RP-56	RP-120805	0910	1	Change in Scheduling Information for ETWS	8.16.0	8.17.0
	RP-56	RP-120732	0976	-	Introduction of multiple frequency band indicator	8.16.0	8.17.0

History

Document history		
V8.2.0	November 2008	Publication
V8.3.0	November 2008	Publication
V8.4.0	February 2009	Publication
V8.5.0	April 2009	Publication
V8.6.0	July 2009	Publication
V8.7.0	October 2009	Publication
V8.8.0	February 2010	Publication
V8.9.0	April 2010	Publication
V8.10.0	July 2010	Publication
V8.11.0	October 2010	Publication
V8.12.0	January 2011	Publication
V8.13.0	March 2011	Publication
V8.14.0	July 2011	Publication
V8.15.0	November 2011	Publication
V8.16.0	January 2012	Publication
V8.17.0	July 2012	Publication