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Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA)
Radio Resource Control (RRC);
Protocol specification
(Release 9)

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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: "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: "Band Class Specification for cdma2000 Spread Spectrum Systems".

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

[26] 3GPP2 C.S0024-A: "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: "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: "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: "E-UTRAN - cdma2000 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".

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.

Floor: Mathematical function used to 'round down' i.e. to the nearest integer having a lower value.

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
CMAS	Commercial Mobile Alert Service
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
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

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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, for ETWS capable UEs, ETWS notification, and for CMAS capable UEs, CMAS 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, for ETWS capable UEs, ETWS notification, and for CMAS capable UEs, CMAS 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.

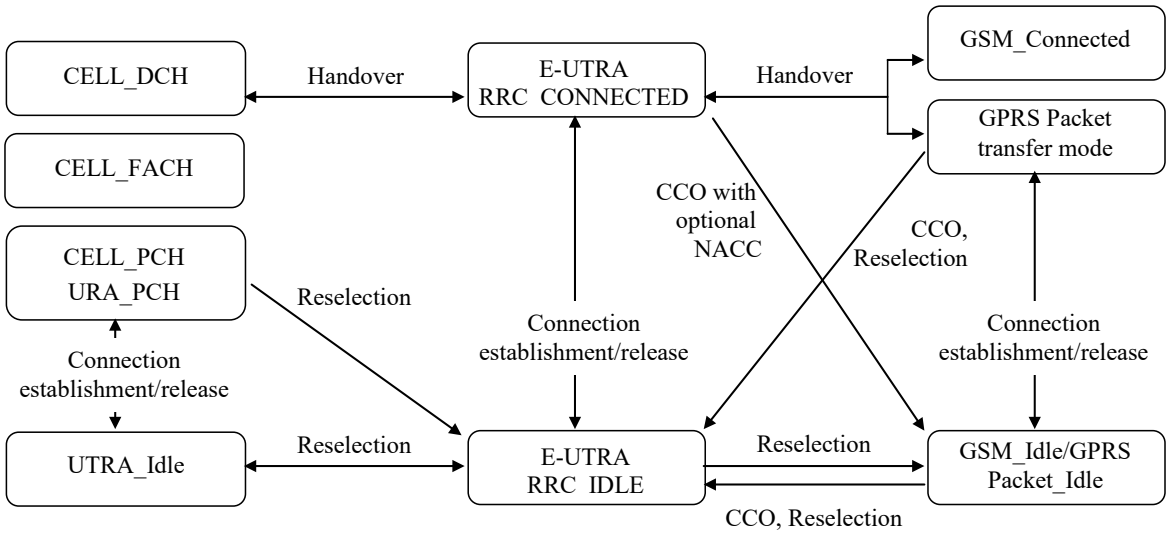

Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP

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.

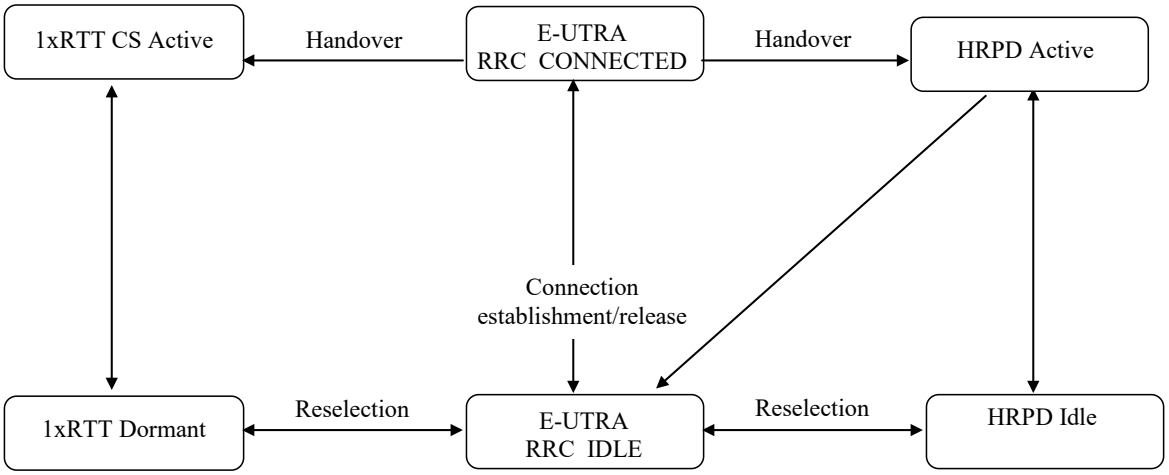

Figure 4.2.1-2: Mobility procedures between E-UTRA and CDMA2000

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, for CMAS;
- 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, CMAS 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 and CMAS) 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.

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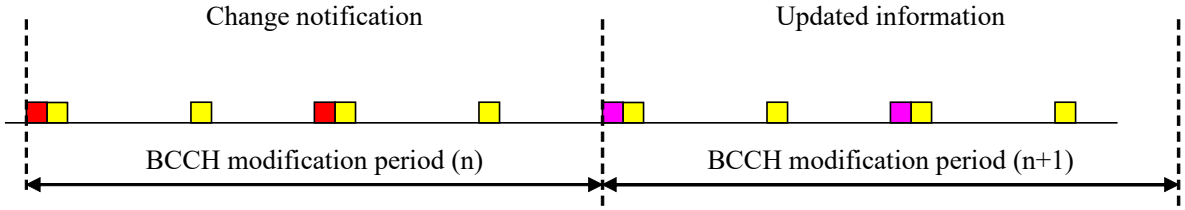

Figure 5.2.1.3-1: Change of system Information

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, CMAS 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 and/or CMAS capable UEs in RRC_CONNECTED shall attempt to read paging at least once every *defaultPagingCycle* to check whether ETWS and/or CMAS 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*.

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*).

5.2.1.5 Indication of CMAS notification

CMAS notification can occur at any point in time. The *Paging* message is used to inform CMAS capable UEs in RRC_IDLE and UEs in RRC_CONNECTED about presence of one or more CMAS notifications. If the UE receives a *Paging* message including the *cmas-Indication*, it shall start receiving the CMAS notifications according to *schedulingInfoList* contained in *SystemInformationBlockType1*.

CMAS notification is contained in *SystemInformationBlockType12*. Segmentation can be applied for the delivery of a CMAS notification. The segmentation is fixed for transmission of a given CMAS 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

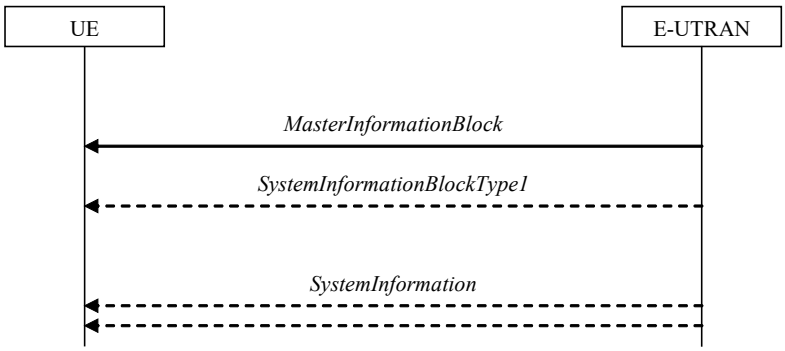

Figure 5.2.2.1-1: System information acquisition, normal

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 an indication about the presence of a CMAS 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.

1> if the UE is CMAS 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, stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* associated with the discarded *warningMessageSegment* ;

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

3> if *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

4> aquire *SystemInformationBlockType12*;

NOTE 3: UEs shall start acquiring *SystemInformationBlockType12* 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 4: 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 not part of the frequency bands supported by the UE:

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*';

1> else:

2> forward the *cellIdentity* to upper layers;

2> forward the *trackingAreaCode* to upper layers;

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*;

1> if in RRC_CONNECTED and UE has previously received IE *rlf-TimersAndConstants*:

2> The UE shall not update its values of the timers and constants in *UE-TimersAndConstants* except for the value of timer t300.

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 *serialNumber* 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;

5.2.2.19 Actions upon reception of *SystemInformationBlockType12*

Upon receiving *SystemInformationBlockType12*, the UE shall:

1> if the *SystemInformationBlockType12* contains a complete *warningMessage*:

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

2> continue reception of *SystemInformationBlockType12*;

1> else:

2> if the received values of *messageIdentifier* and *serialNumber* are the same (each value is the same) as a pair for which a *warningMessage* is currently being assembled:

3> store the received *warningMessageSegment*;

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

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

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

4> stop assembling a *warningMessage* for this *messageIdentifier* and *serialNumber* and delete all stored information held for it;

3> continue reception of *SystemInformationBlockType12*;

2> else if the received values of *messageIdentifier* and *serialNumber* are not the same (each value is the same) as any of the pairs for which a *warningMessage* is currently being assembled:

3> start assembling a *warningMessage* for this *messageIdentifier* and *serialNumber* pair;

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType12*;

The UE should discard warning message segments and the associated values of *messageIdentifier*and *serialNumber* for *SystemInformationBlockType12* if the complete warning message has not been assembled within a period of [3] hours.

Editor's note: The UE capability regarding processing of multiple parallel CMAS notifications is FFS.

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 $a = x \bmod 10$, 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).

The 'NULL' integrity protection algorithm(eia0) is used only for the UE in limited service mode [32, TS33.401]. In case the 'NULL' integrity protection algorithm is used, 'NULL' ciphering algorithm is also used.

NOTE 1: 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;
- to inform about an ETWS primary notification and/ or ETWS secondary notification and/ or;
- to inform about a CMAS 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 or a CMAS 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*;

1> if the *cmas-Indication* is included and the UE is CMAS capable:

2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.5;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

3> acquire *SystemInformationBlockType12*;

5.3.3 RRC connection establishment

5.3.3.1 General

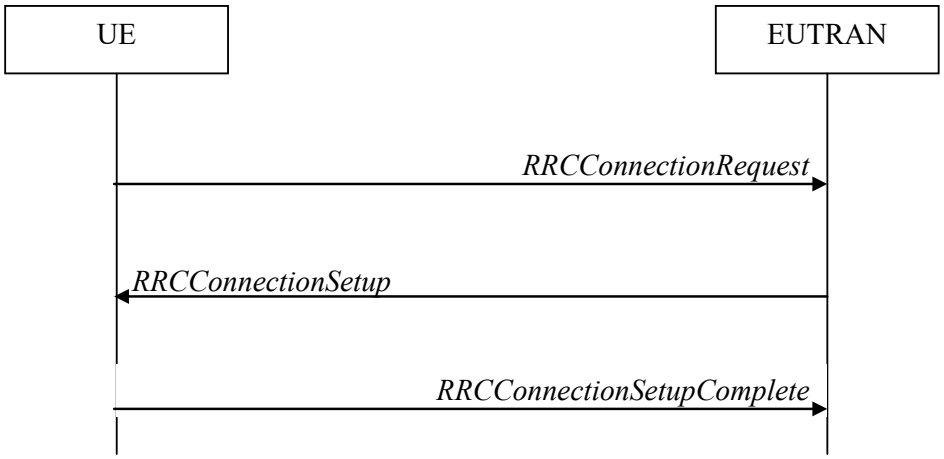

Figure 5.3.3.1-1: RRC connection establishment, successful

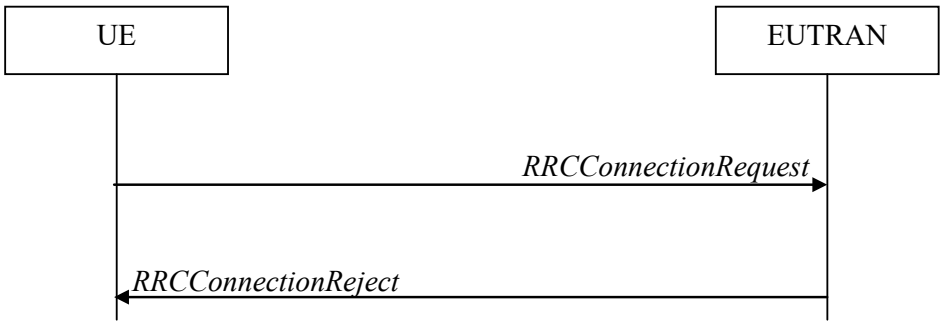

Figure 5.3.3.1-2: RRC connection establishment, network reject

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*:

$T303 = (0.7 + 0.6 * rand) * ac\text{-}BarringTime$

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*:

$T305 = (0.7 + 0.6 * rand) * ac\text{-}BarringTime$

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

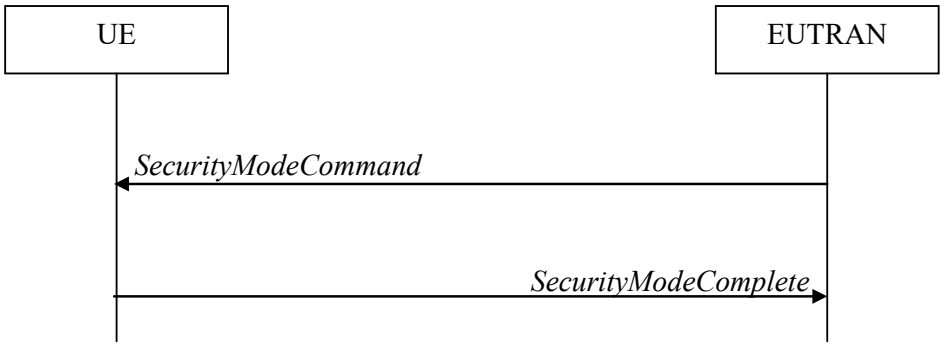

Figure 5.3.4.1-1: Security mode command, successful

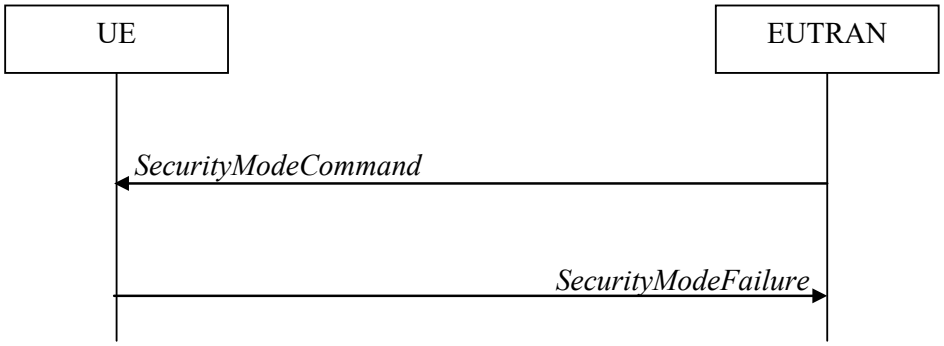

Figure 5.3.4.1-2: Security mode command, failure

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;

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

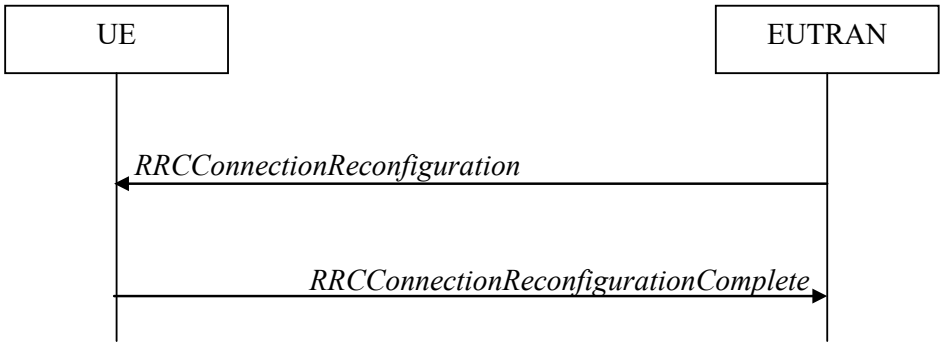

Figure 5.3.5.1-1: RRC connection reconfiguration, successful

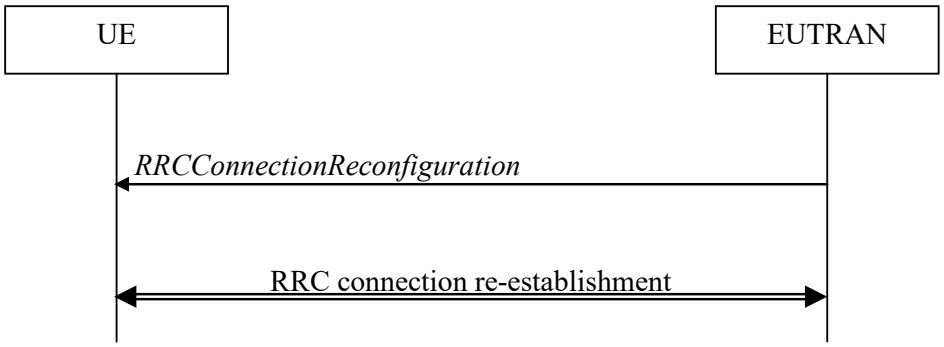

Figure 5.3.5.1-2: RRC connection reconfiguration, failure

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

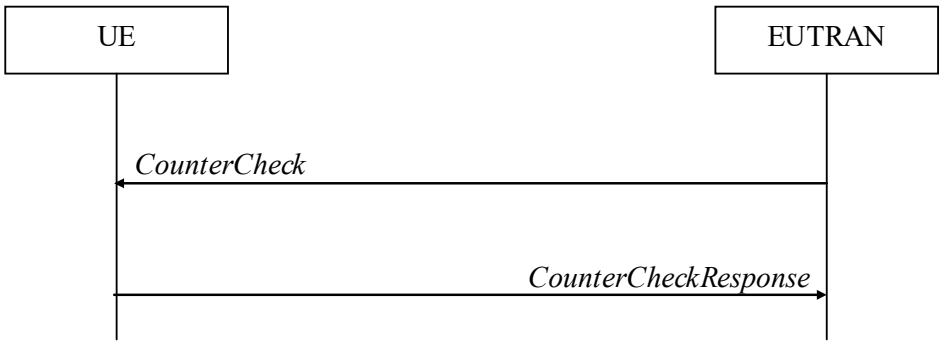

Figure 5.3.6.1-1: Counter check procedure

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

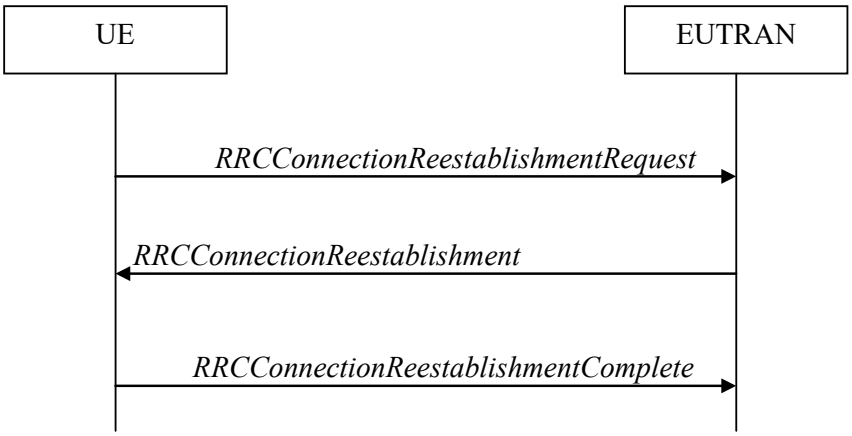

Figure 5.3.7.1-1: RRC connection re-establishment, successful

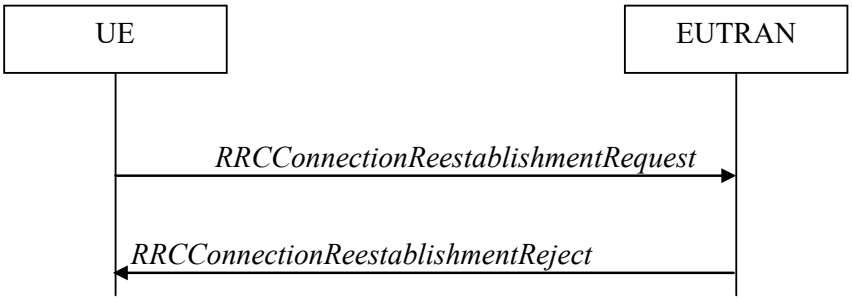

Figure 5.3.7.1-2: RRC connection re-establishment, failure

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;

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

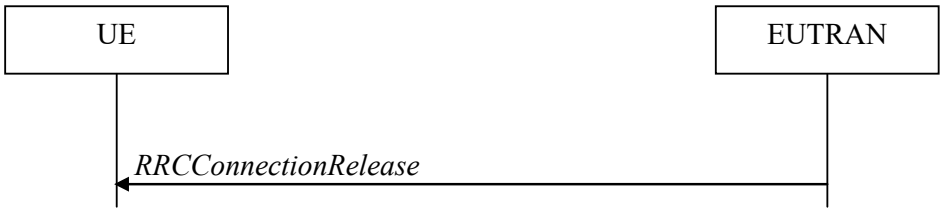

Figure 5.3.8.1-1: RRC connection release, successful

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.

1> if the received *radioResourceConfigDedicated* includes the *rlf-TimersAndConstants*:

2> reconfigure the values of timers and constants as specified in 5.3.10.7;

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;

1> if the *cqi-ReportPeriodic* is included and set to '*release*':

2> release *cqi-Mask*, if previously configured;

5.3.10.7 Radio Link Failure Timers and Constants reconfiguration

The UE shall:

1> reconfigure the value of timers and constants in accordance with received *rlf-TimersAndConstants*

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* and *cqi-Mask* if configured 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

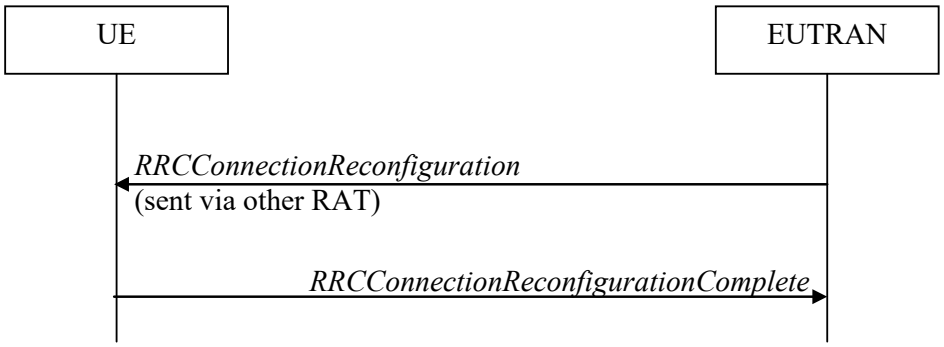

Figure 5.4.2.1-1: Handover to E-UTRA, successful

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

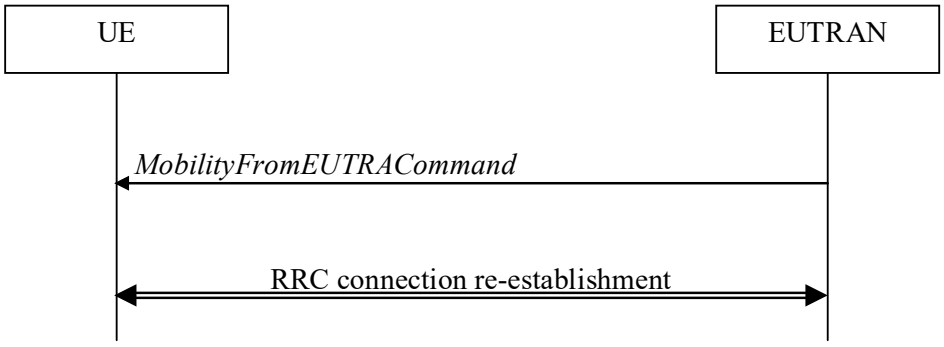

Figure 5.4.3.1-2: Mobility from E-UTRA, failure

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 the following type of mobility:

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

- enhanced CS fallback to CDMA2000 1xRTT, i.e. the *MobilityFromEUTRACommand* message includes radio resources that have been allocated for the UE in the target cell. The enhanced CS fallback to CDMA2000 1xRTT may be combined with concurrent handover or redirection to CDMA2000 HRPD.

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 or in response to reception of CS fallback indication for the UE from MME, 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.

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;

NOTE 2: The *systemInformation* is constructed in the same way as in 2G to 2G NACC, i.e. the PSI messages are encoded as such, whereas the SI messages exclude 2 octets of headers, see TS 44.060[36].

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].

1> if the MobilityFromEUTRACommand message includes the purpose set to 'enhanced1xCsfb':

2> if *messageContainerOneXRTT* is present:

3> forward the *messageContainerOneXRTT* to the CDMA2000 upper layers for the UE to access the cell indicated in the inter-RAT message in accordance with the specification of the target RAT;

2> if m*obilityRequiredHRPD* is present and is set to 'handover-hrpd':

3> forward the *messageContainerHRPD* to the CDMA2000 upper layers for the UE to access the cell indicated in the inter-RAT message in accordance with the specification of the target RAT;

NOTE 4: When the CDMA2000 upper layers in the UE receives both the *messageContainerOneXRTT* and *messageContainerHRPD* the UE performs concurrent access to both CDMA2000 1xRTT and CDMA2000 HRPD RAT.

5.4.3.4 Successful completion of the mobility from E-UTRA

Upon successfully completing the handover, the cell change order or enhanced 1xRTT CS fallback, 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;

NOTE: If the UE performs enhanced 1xRTT CS fallback along with concurrent mobility to CDMA2000 HRPD and the connection to either CDMA2000 1xRTT or CDMA2000 HRPD succeeds, then the mobility from E-UTRA is considered successful.

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;

NOTE: For enhanced CS fallback to CDMA2000 1xRTT, the above UE behavior applies only when the UE is attempting the enhanced 1xRTT CS fallback and connection to the target radio access technology fails or if the UE is attempting enhanced 1xRTT CS fallback along with concurrent mobility to CDMA2000 HRPD and connection to both the target radio access technologies fails.

5.4.4 Handover from E-UTRA preparation request (CDMA2000)

5.4.4.1 General

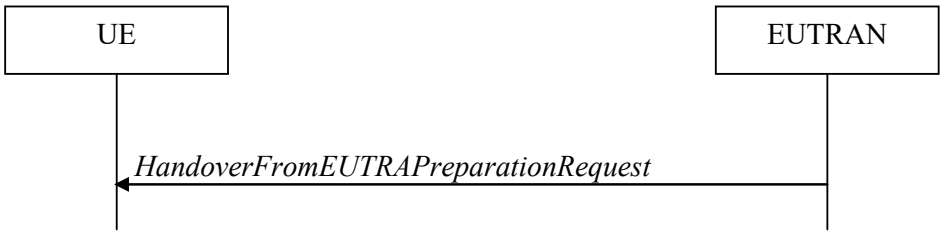

Figure 5.4.4.1-1: Handover from E-UTRA preparation request

The purpose of this procedure is to trigger the UE to prepare for handover or enhanced 1xRTT CS fallback to CDMA2000 by requesting a connection with this network. The UE may use this procedure to concurrently prepare for handover to CDMA2000 HRPD along with preparation for enhanced CS fallback to CDMA2000 1xRTT. 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 or CS fallback indication for the UE, 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 or enhanced 1xRTT CS fallback 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;

1> if *concurrentPrepHRPD* is present in the received message:

2> indicate to the CDMA2000 upper layers the request to prepare for concurrent enhanced CS fallback to CDMA2000 1xRTT and handover to CDMA2000 HRPD;

5.4.5 UL handover preparation transfer (CDMA2000)

5.4.5.1 General

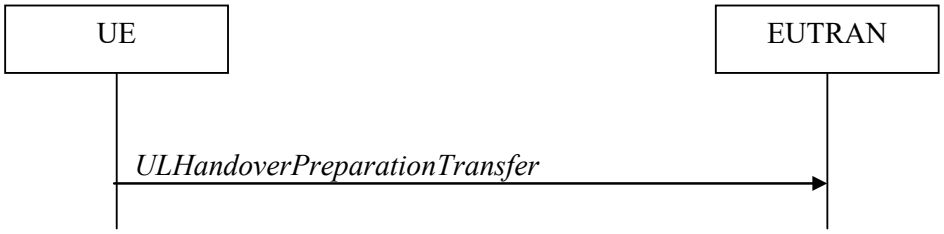

Figure 5.4.5.1-1: UL handover preparation transfer

The purpose of this procedure is to tunnel the handover related CDMA2000 dedicated information or enhanced 1xRTT CS fallback 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. If preparing for enhanced CS fallback to CDMA2000 1xRTT and handover to CDMA2000 HRPD, the UE sends two consecutive *ULHandoverPreparationTransfer* messages to E-UTRAN, one per addressed CDMA2000 RAT Type. 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 or enhanced 1xRTT CS fallback 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;

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

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

$\boldsymbol{M_n}$ is the latest received measurement result from the physical layer;

$\boldsymbol{F_n}$ is the updated filtered measurement result, that is used for evaluation of reporting criteria or for measurement reporting;

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

$\boldsymbol{a} = 1/2^{(\boldsymbol{k}/4)}$, where $\boldsymbol{k}$ 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* $\boldsymbol{k}$ 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 *cellGlobalId* 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.

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).

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.

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).

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

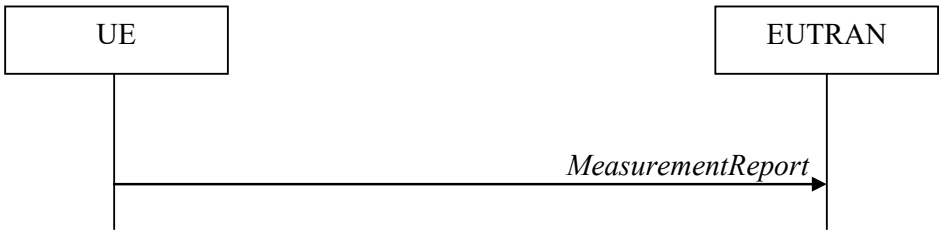

Figure 5.5.5-1: Measurement reporting

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 decreasing quantity, 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 *cellGlobalId* 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

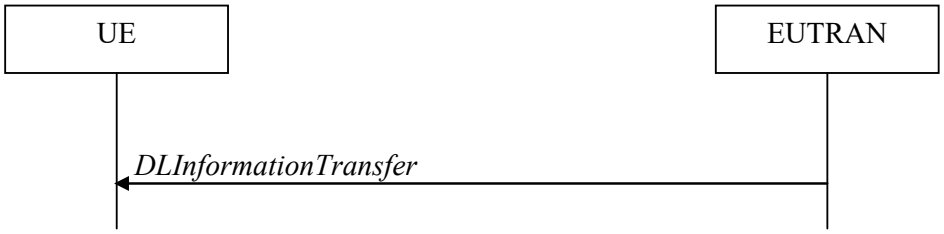

Figure 5.6.1.1-1: DL information transfer

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

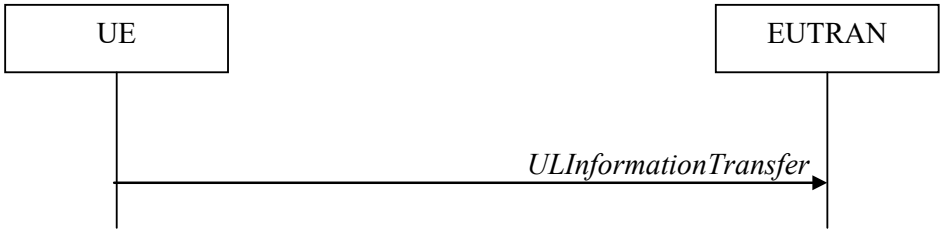

Figure 5.6.2.1-1: UL information transfer

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

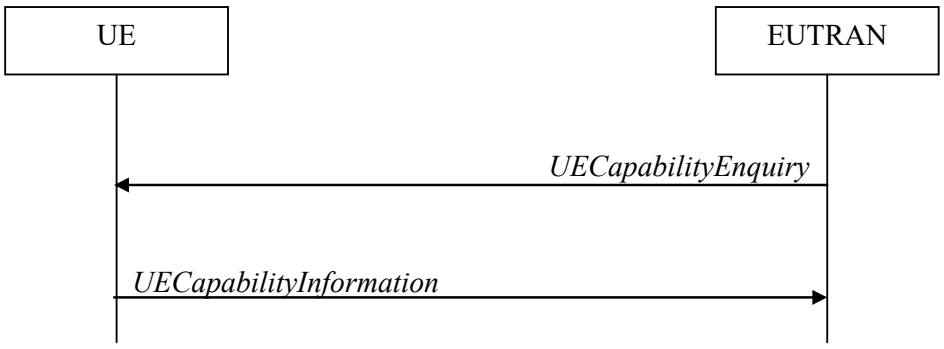

Figure 5.6.3.1-1: UE capability transfer

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 [41]) 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

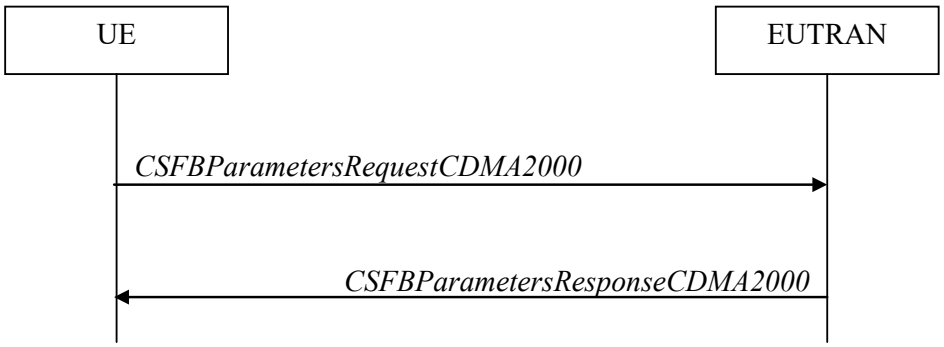

Figure 5.6.4.1-1: CSFB to 1x Parameter transfer

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:

2> ignore the message;

NOTE This section applies in case one or more fields is set to a code point not defined in this version of the transfer syntax. In this case, 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 (Used in downlink only)	*Optionally present, No action* 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

CounterCheckResponse message

```
-- 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

CSFBParametersRequestCDMA2000 message

```
-- 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. This message is also used to trigger a tunneled preparation procedure with a CDMA2000 1xRTT RAT to obtain traffic channel resources for the enhanced CS fallback to CDMA2000 1xRTT, which may also involve a concurrent preparation for handover to CDMA2000 HRPD.

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
    v9xyNonCriticalExtension            HandoverFromEUTRAPreparationRequest-v9x0-IEs    OPTIONAL  --
Need OP
}

HandoverFromEUTRAPreparationRequest-v9x0-IEs ::= SEQUENCE {
    v9x0NonCriticalExtensions           SEQUENCE {
        concurrentPrepHRPD                  ENUMERATED {true}   OPTIONAL        -- Cond PSHO
    },
    nonCriticalExtension                SEQUENCE {}                 OPTIONAL    -- Need OP
}

-- ASN1STOP
```

HandoverFromEUTRAPreparationRequest field descriptions
concurrentPrepHRPD   Trigger of concurrent preparation for handover to CDMA2000 HRPD in addition to preparation for enhanced CS fallback to CDMA2000 1xRTT. If this field is present, concurrent preparation for handover to CDMA2000 HRPD is enabled. Otherwise, concurrent preparation for handover to CDMA2000 HRPD is disabled

Conditional presence	Explanation
cdma2000-Type	The field is mandatory present if the *cdma2000-Type* = *type1XRTT*; otherwise it is not present.
PSHO	This field is optional 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), or enhanced CS fallback to CDMA2000 1xRTT.

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,
            mobilityFromEUTRACommand-r9 MobilityFromEUTRACommand-r9-IEs, spare2 NULL, spare1    NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

MobilityFromEUTRACommand-r8-IEs ::= SEQUENCE {
    cs-FallbackIndicator                BOOLEAN,
    purpose                             CHOICE{
        handover                            Handover,
        cellChangeOrder                     CellChangeOrder
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

MobilityFromEUTRACommand-r9-IEs ::= SEQUENCE {
    cs-FallbackIndicator                BOOLEAN,
    purpose                             CHOICE{
        handover                            Handover,
        cellChangeOrder                     CellChangeOrder,
        enhanced1xCsfb                      Enhanced1xCsfb,
        ...
    },
    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))

Enhanced1xCsfb ::=                  SEQUENCE {
    mobilityRequiredHRPD                ENUMERATED {
                                            handover-hrpd, redirection-hrpd
                                        }               OPTIONAL,   -- Need OP
    messageContainerOneXRTT         OCTET STRING    OPTIONAL,
    messageContainerHRPD                OCTET STRING    OPTIONAL,
    redirectedCarrierInfoHRPD           CarrierFreqCDMA2000 OPTIONAL    -- Cond concurrent-HRPD-
redirection
}

-- 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'*.
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 complete System Information (SI) message as defined in TS 44.018 [45, table 9.1.1] 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.
mobilityRequiredHRPD
This field indicates whether or not mobility to CDMA2000 HRPD is to be performed by the UE and it also indicates the type of mobility to CDMA2000 HRPD that is to be performed; If this field is not present the UE shall perform only the enhanced CS fallback to CDMA2000 1xRTT.
messageContainerOneXRTT
This field contains a message specified in CDMA2000 1xRTT standard that either tells the UE to move to a specific 1xRTT target cell or indicates a failure to allocate resources for the enhanced CS fallback to CDMA2000 1xRTT.
messageContainerHRPD
This field contains a message specified in CDMA2000 HRPD standard that either tells the UE to move to a specific HRPD target cell or indicates a failure to allocate resources for the handover to CDMA2000 HRPD.
redirectedCarrierInfoHRPD
The *redirectedCarrierInfoHRPD* indicates a CDMA2000 carrier frequency and is used to redirect the UE to a HRPD carrier frequency, by means of the cell selection upon leaving RRC_CONNECTED as specified in TS 36.304 [4].

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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
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
concurrent-HRPD-redirection	The field is mandatory present if the m*obilityRequiredHRPD* is set to "redirection-hrpd"; otherwise the field is not present.

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) 3GPP TS 44.060, version 6.13.0 or later (clause 11.2.43) 3GPP TS 44.060, version 7.6.0 or later (clause 11.2.46)	HANDOVER COMMAND PS HANDOVER COMMAND 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                Paging-v9x0-IEs                     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)

Paging-v9x0-IEs ::=         SEQUENCE {
    v9x0NonCricticalExtensions      SEQUENCE {
        cmas-Indication                 ENUMERATED {true}                   OPTIONAL    -- Need ON
    },
```

```
    nonCriticalExtension            SEQUENCE {}                             OPTIONAL    -- Need OP
}

-- 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, SIB11 and SIB12.
etws-Indication If present: indication of an ETWS primary notification and/ or ETWS secondary notification.
cmas-Indication If present: indication of a CMAS 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

***RRCConnectionReconfiguration* message**

```
-- 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,
```


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```
    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,
        ...,
        sib12                               SystemInformationBlockType12
    },
    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                   INTEGER (1..64),
    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-v9x0-IEs
    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, sibType12, spare6, spare5,
                                        spare4, spare3, spare2, spare1, ...}

SystemInformationBlockType1-v9x0-IEs::= SEQUENCE {
    v9x0NonCricticalExtensions          SEQUENCE {
        imsEmergencySupportIndicator    ENUMERATED {supported}              OPTIONAL    -- Need OP
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- 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].
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.
freqBandIndicator Defined in TS 36.101 [42, table 5.5-1].
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 within the primary PLMN the cell belongs to. The IE is present in a CSG cell.
imsEmergencySupportIndicator Indicates whether the cell supports IMS emergency bearer services for UEs in limited service mode. If absent, IMS emergency call is not supported by the network in the cell for UEs in limited service mode.

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,
    ...
}

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.
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.
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 $\mathbf{S_{intrasearch}}$, 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 $\mathbf{S_{nonintrasearch}}$, 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,
    ...
}

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
    ...
}

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.

– *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
    ...
}

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),
    ...
}

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),
    ...
}

-- 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 List of carrier frequencies of UTRA FDD.
carrierFreqListUTRA-TDD List of carrier frequencies of UTRA TDD.
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, UE measurement based redirection and enhanced 1xRTT CS fallback 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, UE measurement based redirection and enhanced 1xRTT CS fallback from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4].
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 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 and enhanced CS fallback 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 first bit contains bit 1 of the equivalent IE defined in TS 23.041 [37, 9.4.1.2.2], TS 36.413 [39, 9.2.1.44] and encoded according to TS 23.041 [37] and so on.
serialNumber
Identifies variations of an ETWS notification. The first bit contains bit 1 of the equivalent IE defined in TS 23.041 [37, 9.4.1.2.1], TS 36.413 [39, 9.2.1.45] and encoded according to TS 23.041 [37] and so on.
warningType
Identifies the warning type of the ETWS primary notification and provides information on emergency user alert and UE popup. The first octet contains octet 1 of the equivalent IE defined in TS 23.041 [37, 9.3.24], TS 36.413 [39, 9.2.1.50] and encoded according to TS 23.041 [37], and so on.
warningSecurityInfo
Provides security information for the ETWS notification. The first octet contains octet 1 of the equivalent IE defined in TS 23.041 [37], TS 36.413 [39] and encoded according to TS 23.041 [37] 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 first bit contains bit 1 of the equivalent IE defined in TS 23.041 [37, 9.4.1.2.2], TS 36.413 [39, 9.2.1.44] and encoded according to TS 23.041 [37] and so on.
serialNumber
Identifies variations of an ETWS notification. The first bit contains bit 1 of the equivalent IE defined in TS 23.041 [37, 9.4.1.2.1], TS 36.413 [39, 9.2.1.45] and encoded according to TS 23.041 [37] and so on.
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]. The first octet of the *Warning Message Contents* IE is equivalent to the *CB data* IE defined in and encoded according to TS 23.041 [37] and so on.
dataCodingScheme
Identifies the alphabet/coding and the language applied variations of an ETWS notification. The octet contains the octet of the equivalent IE defined in TS 23.041 [37], TS 36.413 [39] 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.

– *SystemInformationBlockType12*

The IE *SystemInformationBlockType12* contains a CMAS notification.

SystemInformationBlockType12 information element

```
-- ASN1START

SystemInformationBlockType12 ::=    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
```

SystemInformationBlockType12 field descriptions
messageIdentifier Identifies the source and type of CMAS notification. The first bit contains bit 1 of the equivalent IE defined in TS 23.041 [37, 9.4.1.2.2], TS 36.413 [39, 9.2.1.44] and encoded according to TS 23.041 [37] and so on.
serialNumber Identifies variations of a CMAS notification. The first bit contains bit 1 of the equivalent IE defined in TS 23.041 [37, 9.4.1.2.1], TS 36.413 [39, 9.2.1.45] and encoded according to TS 23.041 [37] and so on.
warningMessageSegmentType Indicates whether the included CMAS warning message segment is the last segment or not.
warningMessageSegmentNumber Segment number of the CMAS 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]. The first octet of the *Warning Message Contents* IE is equivalent to the *CB data* IE defined in and encoded according to TS 23.041 [37] and so on.
dataCodingScheme Identifies the alphabet/coding and the language applied variations of a CMAS notification. The octet contains the octet of the equivalent IE defined in TS 23.041 [37], TS 36.413 [39] and encoded according to TS 23.038 [38].

Conditional presence	Explanation
Segment1	The field is mandatory present in the first segment of SIB12, 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 [21, 6.2.1].
transmissionMode Points to one of Transmission modes defined in TS 36.213 [23, 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 $n_{\mathrm{PUCCH}}^{(2)}$, 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].

– *CQI-ReportConfigExt*

The IE *CQI-ReportConfigExt* is used to specify further details of the CQI reporting configuration.

CQI-ReportConfigExt information elements

```
-- ASN1START

CQI-ReportConfigExt ::=         SEQUENCE {
    cqi-Mask                        ENUMERATED {true}           OPTIONAL,       -- Cond cqi-Setup
    ...
}
-- ASN1STOP
```

***CQI-ReportConfigExt* field descriptions**
cqi-Mask Limits CQI/PMI/RI reports to the on-duration period of the DRX cycle, see TS 36.321 [6].

Conditional presence	Explanation
cqi-Setup	The field is optional present if the *cqi-ReportPeriodic* in the *cqi-ReportConfig* is set to '*setup*', need ON. Otherwise the field is not present.

– *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. In TDD, this can point to a DL or UL sub-frame.
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
    ...,
    cqi-ReportConfigExt                 CQI-ReportConfigExt             OPTIONAL        -- Need OR
}

-- 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_{UMAX}, 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: $N_{\mathrm{RB}}^{\mathrm{HO}}$, 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*, see 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
    ...,
    [[  --v9xy extension addition group:
        rlf-TimersAndConstants              RLF-TimersAndConstants  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 explictly 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.
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: $n^{(1)}_{\mathrm{PUCCH,SRI}}$. 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, see TS 36.211 [21, table 5.5.3.2-1].
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: $k_{\mathrm{TC}} \in \{0,1\}$, 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 $m_{\mathrm{SRS},0}^{\max}$ 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.
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.
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: $P_{\text{O_NOMINAL_PUSCH}}(0)$. 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: $P_{\text{O_UE_PUSCH}}(0)$. 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 {
                                            eia0, 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].
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 a 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].

– *MobilityControlInfo*

The IE *MobilityControlInfo* includes parameters relevant for network controlled mobility to/within E-UTRA.

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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.S0087 [44].

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].

– 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
```


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***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 Used to control when the UE should re-register.
secondaryPreRegistrationZoneIdList 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.

Q- OffsetRange information element

```
-- 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.

Q- OffsetRangeInterRAT information element

```
-- 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.

ReselectionThreshold information element

```
-- 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.

SpeedStateScaleFactors information element

```
-- ASN1START

SpeedStateScaleFactors ::=          SEQUENCE {
    sf-Medium                           ENUMERATED {oDot25, oDot5, oDot75, 1Dot0},
    sf-High                             ENUMERATED {oDot25, oDot5, oDot75, 1Dot0}
}
-- 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.

T-Reselection information element

```
-- 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.

AllowedMeasBandwidth information element

```
-- 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.

***Hysteresis* information element**

```
-- 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.

***MeasConfig* information element**

```
-- 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.

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– *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.
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
```


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– *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-CDMA2000* 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
```

– *RLF-TimersAndConstants*

The IE RLF-*TimersAndConstants* contains UE specific timers and constants to be used by the UE in RRC_CONNECTED.

RLF-TimersAndConstants information element

```
-- ASN1START

RLF-TimersAndConstants ::=          SEQUENCE {
    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
```

***RLF-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.

– *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 24.008 [49]. 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], 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
    },
    v9xyNonCriticalExtension                UE-EUTRA-Capability-v9x0-IEs        OPTIONAL
}

UE-EUTRA-Capability-v9x0-IEs ::=    SEQUENCE {
    v9x0NonCriticalExtensions           SEQUENCE {
        cdma2000-e1xCsfb                    IRAT-ParametersCDMA2000-e1xCsfb             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, ...}

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}
}

IRAT-ParametersCDMA2000-e1xCsfb ::= SEQUENCE {
    enhancedCsfbOneXRTT         ENUMERATED {supported},
    enhancedCsfbOneXRTTWithPsho ENUMERATED {supported}
}

SupportedBandList1XRTT ::=          SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

-- ASN1STOP
```


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***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.
enhancedCsfbOneXRTT
Indicates whether the UE supports enhanced 1xRTT CS fallback or not.
enhancedCsfbOneXRTTWithPsho
Indicates whether the UE supports concurrent enhanced CS fallback to CDMA2000 1xRTT and handover/redirection to CDMA2000 HRPD.

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 {
```


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```
                                        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 neighbouring cells within a
                                            -- measurement object (incl blacklisted cells)
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
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

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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 *RRCConnectionReestabilshmentRequest*	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*

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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;

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- 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.

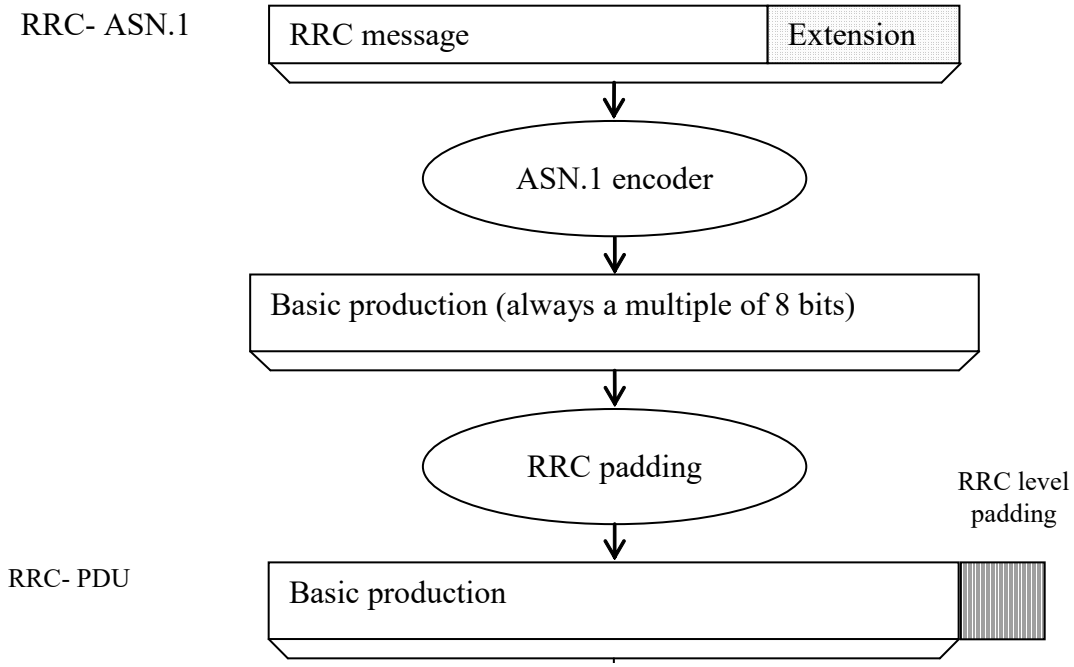

Figure 8.5-1: RRC level padding

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.

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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

9.2.1 SRB configurations

9.2.1.1 SRB1

Parameters

Name	Value	Semantics description	Ver
RLC configuration CHOICE	am		
ul-RLC-Config *>t-PollRetransmit* *>pollPDU* *>pollByte*	 ms45 infinity infinity		

Name	Value	Semantics description	Ver
>maxRetxThreshold	t4		
dl-RLC-Config *>t-Reordering* *>t-StatusProhibit*	 ms35 ms0		
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* *>pollPDU* *>pollByte* *>maxRetxThreshold*	 ms45 infinity infinity t4		
dl-RLC-Config *>t-Reordering* *>t-StatusProhibit*	 ms35 ms0		
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	n5		
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* *>sps-ConfigUL*	 release release		

9.2.4 Default physical channel configuration

Parameters

Name	Value	Semantics description	Ver
PDSCH-ConfigDedicated *>p-a*	 dB0		

Name	Value	Semantics description	Ver
PUCCH-ConfigDedicated *> tdd-AckNackFeedbackMode* *>ackNackRepetition*	 bundling release	Only valid for TDD mode	
PUSCH-ConfigDedicated *>betaOffset-ACK-Index* *>betaOffset-RI-Index* *>betaOffset-CQI-Index*	 10 12 15		
UplinkPowerControlDedicated *>p0-UE-PUSCH* *>deltaMCS-Enabled* *>accumulationEnabled* *>p0-UE-PUCCH* *>pSRS-Offset* *> filterCoefficient*	 0 en0 (disabled) TRUE 0 7 fc4		
tpc-pdcch-ConfigPUCCH	release		
tpc-pdcch-ConfigPUSCH	release		
CQI-ReportConfig *> CQI-ReportPeriodic*	 release		
CQI-ReportConfigExt *> cqi-Mask*	 release		
SoundingRS-UL-ConfigDedicated	release		
AntennaInfoDedicated *>transmissionMode* *>codebookSubsetRestriction* *>ue-TransmitAntennaSelection*	 tm1, tm2 N/A release	 If the number of PBCH antenna ports is one, tm1 is used as default; otherwise tm2 is used as default	
SchedulingRequestConfig	release		

9.2.5 Default values timers and constants

Parameters

Name	Value	Semantics description	Ver
t310	ms1000		
n310	n1		
t311	ms1000		
n311	n1		

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 *>> rlc-Config* *>> logicalChannelConfig* *>>> ul-SpecificParameters* *>>>> logicalChannelGroup*	OPTIONAL, -Cond HO-Conn OPTIONAL, -Cond Setup OPTIONAL, -Cond Setup OPTIONAL, -Cond UL OPTIONAL, -Need OR	- - - - The conditional presence applies -
>drb-ToAddModList *>> eps-BearerIdentity* *>> pdcp-Config* *>>> discardTimer* *>>> rlc-AM* *>>> rlc-UM* *>> rlc-Config* *>> logicalChannelIdentity* *>> logicalChannelConfig* *>>> ul-SpecificParameters* *>>>> logicalChannelGroup*	OPTIONAL, -Cond HO-toEUTRA OPTIONAL, -Cond DRB-Setup OPTIONAL, -Cond PDCP OPTIONAL, -Cond Setup OPTIONAL, -Cond Rlc-AM OPTIONAL, -Cond Rlc-UM OPTIONAL, -Cond Setup OPTIONAL, -Cond DRB-Setup OPTIONAL, -Cond Setup OPTIONAL, -Cond UL OPTIONAL, -Need OR	- - - - - The conditional presence applies - The conditional presence applies - - - - The conditional presence applies -
> mac-MainConfig *>> ul-SCH-Config* *>>> maxHARQ-Tx* *>> periodicBSR-Timer* *>> drx-Config* *>>> shortDRX* *>> phr-Config*	OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON	- - - - - - -
> sps-Config *>> sps-ConfigDL* *>> sps-ConfigUL* *>>> p0-Persistent* *>>> twoIntervalsConfig*	OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need OP OPTIONAL, -Cond TDD	- - - - - The conditional presence applies
> physicalConfigDedicated *>> pdsch-ConfigDedicated* *>> pucch-ConfigDedicated* *>>> tdd-AckNackFeedbackMode* *>> pusch-ConfigDedicated* *>> uplinkPowerControlDedicated* *>> tpc-PDCCH-ConfigPUCCH* *>> tpc-PDCCH-ConfigPUSCH* *>> cqi-ReportConfig* *>>> cqi-ReportingModeAperiodic* *>>> cqi-ReportPeriodic* *>> soundingRS-UL-ConfigDedicated* *>> antennaInfo* *>>> codebookSubsetRestriction* *>> schedulingRequestConfig* *>> cqi-ReportConfigExt* *>>> cqi-Mask*	OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Cond TDD OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need OR OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Cond TM OPTIONAL, -Need ON OPTIONAL, -Need OR OPTIONAL, -Cond cqi-reportPeriod	- - - - The conditional presence applies - - - - - - - - - - The conditional presence applies - - - The conditional presence applies
> rlf-TimersAndConstants	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 *>> measObject* *>>> measObjectEUTRA* *>>>> cellsToAddModList* *>>>> blackCellsToAddModList* *>>>> cellForWhichToReportCGI* *>>> MeasObjectUTRA* *>>>> cellsToAddModList* *>>>> cellForWhichToReportCGI* *>>> MeasObjectGERAN* *>>>> cellForWhichToReportCGI* *>>> MeasObjectCDMA2000* *>>>> searchWindowSize* *>>>> cellsToAddModList* *>>>> cellForWhichToReportCGI*	OPTIONAL, -Need ON - - OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON - OPTIONAL, -Need ON OPTIONAL, -Need ON - OPTIONAL, -Need ON - OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON	- - - - - - - - - - - - - - - -
> reportConfigToAddModList	OPTIONAL, -Need ON	-
> measIdToAddModList	OPTIONAL, -Need ON	-
> quantityConfig *>> quantityConfigEUTRA* *>> quantityConfigUTRA* *>> quantityConfigGERAN* *>> quantityConfigCDMA2000*	OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON OPTIONAL, -Need ON	- - - - -
> s-Measure	OPTIONAL, -Need ON	-
> preRegistrationInfoHRPD *>> preRegistrationZoneId* *>> secondaryPreRegistrationZoneIdList*	OPTIONAL, -Need OP OPTIONAL, -Cond PreRegAllowed OPTIONAL, -Need OR	 - The conditional presence applies -
> 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

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).

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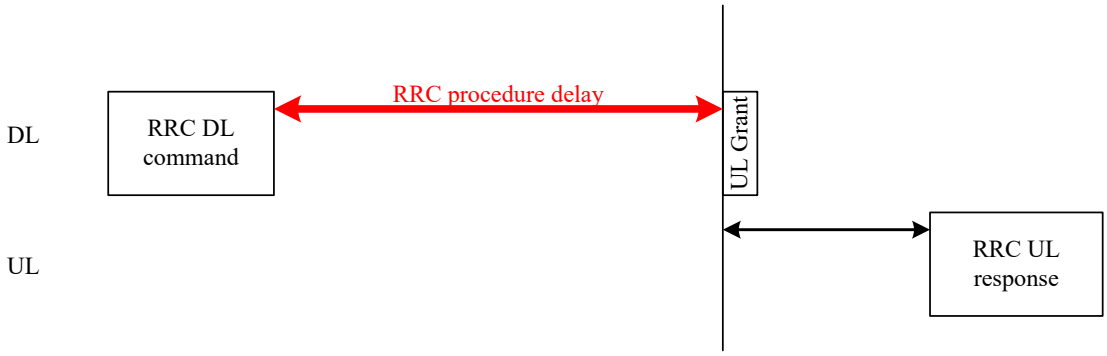

Figure 11.2-1: Illustration of RRC procedure delay

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 mobility				
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.

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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:* where versions of an ASN.1 field or type need to be distinguished by release, a suffix of the form "-rX" is used, *e.g.*, *Foo-r9* for the Rel-9 version of the ASN.1 type *Foo*. If an ASN.1 field or type provides only the extension of a corresponding earlier field or type (see sub-clause A.4), a suffix of the form "-vXYZext" is used, e.g., *AnElement-v10b0ext* for the extension of the ASN.1 type *AnElement* introduced in the version 10.11.0 of the specification. Digits *0...9, 10, 11, etc.* are used to represent the first digit of the version number. Lower case letters *a, b, c, etc.* are used to represent the second (and third) digit 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.

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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 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-IdentityList ::=               SEQUENCE (SIZE (1..6)) OF PLMN-IdentityList

PLMN-IdentityList ::=               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 a 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 a 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 overhead associated with the extension markers, readability.

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 likelyhood 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.

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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

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:

- 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
- 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 which 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
- 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

- 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.

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.

The following example illustrates the use of the extension marker for a number of elementary cases (sequence, enumerated, choice).

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 },
    field2                                  CHOICE {
        field2a                                 InformationElement12a,
        field2b                                 InformationElement12b,
        ...,
        field2c                                 InformationElement12c
    },
    ...,
    field3                                  InformationElement13
}

-- ASN1STOP
```

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-v8x0-IEs                     OPTIONAL    -- Need OP
}

RRCMessage-v8x0-IEs ::=         SEQUENCE {
    v8x0NonCricticalExtensions      SEQUENCE {
        field4                          InformationElement4                 OPTIONAL,   -- Need OP
        field5                          InformationElement5                 OPTIONAL    -- Cond C54
    },
    nonCriticalExtension            RRCMessage-v9x0-IEs                     OPTIONAL    -- Need OP
}

RRCMessage-v9x0-IEs ::=         SEQUENCE {
    v9x0NonCricticalExtensions      SEQUENCE {
        field6                          InformationElement6                 OPTIONAL    -- Need ON
    },
    nonCriticalExtensions           SEQUENCE {}                             OPTIONAL    -- Need OP
}

-- ASN1STOP
```

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

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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	+	-	-	Justification for P: If the RRC connection only for signalling not requiring DRBs or ciphered messages, or the signalling connection has to be released prematurely, 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:

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- 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*. 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) - Multi-user MIMO for PDSCH - 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.

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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	- 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	- 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	- Periodical measurement reporting for non-ANR related measurements	
17	- Periodical measurement reporting for SON / ANR - ANR related intra-frequency measurement reporting events	- can only be set to 1 if the UE has set bit number 5 to 1.
18	- ANR related inter-frequency measurement reporting events	- can only be set to 1 if the UE has set bit number 5 to 1.
19	- ANR related inter-RAT measurement reporting events	- can only be set to 1 if the UE has set bit number 5 to 1.
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	
26	- HRPD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode	
27	Undefined	
28	Undefined	
29	Undefined	
30	Undefined	
31	Undefined	
32	Undefined	

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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)	Group 12	Group 11	Group 13

In case measurements and reporting function is not supported by 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.

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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

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	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	8.6.0
	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

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	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
	RP-44	RP-090516	0195	2	RB combination in feature group indicator	8.5.0	8.6.0
	RP-44	RP-090516	0196	1	CR for need code for fields in mobilityControlInfo	8.5.0	8.6.0
	RP-44	RP-090497	0197	-	Alignment of pusch-HoppingOffset with 36.211	8.5.0	8.6.0
	RP-44	RP-090570	0198	-	Explicit srb-Identity values for SRB1 and SRB2	8.5.0	8.6.0
	RP-44	RP-090516	0199	-	Removing use of *defaultValue* for *mac-MainConfig*	8.5.0	8.6.0
09/2009	RP-45	RP-090906	0200	-	Proposed update of the feature grouping	8.6.0	8.7.0
	RP-45	RP-090906	0201	-	Clarification on measurement object configuration for serving frequency	8.6.0	8.7.0
	RP-45	RP-090906	0202	-	Correction regarding SRVCC	8.6.0	8.7.0
	RP-45	RP-090906	0203	-	Indication of DRB Release during HO	8.6.0	8.7.0
	RP-45	RP-090906	0204	1	Correction regarding application of dedicated resource configuration upon handover	8.6.0	8.7.0
	RP-45	RP-090906	0205	-	REL-9 protocol extensions in RRC	8.6.0	8.7.0
	RP-45	RP-090906	0206	-	In-order delivery of NAS PDUs at RRC connection reconfiguration	8.6.0	8.7.0
	RP-45	RP-090906	0207	-	Correction on Threshold of Measurement Event	8.6.0	8.7.0
	RP-45	RP-090906	0210	-	Clarification on dedicated resource of RA procedure	8.6.0	8.7.0
	RP-45	RP-090906	0213	1	Cell barring when MasterInformationBlock or SystemInformationBlock1 is missing	8.6.0	8.7.0
	RP-45	RP-090915	0218	-	Security threat with duplicate detection for ETWS	8.6.0	8.7.0
	RP-45	RP-090906	0224	-	Clarification on supported handover types in feature grouping	8.6.0	8.7.0
	RP-45	RP-090906	0250	1	Handling of unsupported / non-comprehended frequency band and emission requirement	8.6.0	8.7.0
	RP-45	RP-090906	0251	-	RB combinations in feature group indicator 20	8.6.0	8.7.0
09/2009	RP-45	RP-090934	0220	1	Introduction of Per-QCI radio link failure timers (option 1)	8.7.0	9.0.0
	RP-45	RP-090926	0222	-	Null integrity protection algorithm	8.7.0	9.0.0
	RP-45	RP-090926	0223	-	Emergency Support Indicator in BCCH	8.70	9.0.0
	RP-45	RP-090934	0230	2	CR to 36.331 for Enhanced CSFB to 1xRTT with concurrent PS handover	8.7.0	9.0.0
	RP-45	RP-090934	0243	-	REL-9 on Miscellaneous editorial corrections	8.7.0	9.0.0
	RP-45	RP-090934	0247	-	Periodic CQI/PMI/RI masking	8.7.0	9.0.0
	RP-45	RP-090933	0252	-	Introduction of CMAS	8.7.0	9.0.0

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