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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.
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[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–v 1.0: "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-v3.0: "cdma2000 High Rate Packet Data Air Interface Specification".

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

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

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

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

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

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

[33] 3GPP2 C.S0002-A_v6.0 "Physical Layer Standard for cdma2000 Spread Spectrum Systems - Release A"

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

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

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

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

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

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

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

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

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.

(For further study).

3.2 Abbreviations

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

1xRTT	CDMA2000 1x Radio Transmission Technology
AM	Acknowledged Mode
ASN.1	Abstract Syntax Notation.1
ARQ	Automatic Repeat Request
AS	Access Stratum
BCCH	Broadcast Control Channel
BCH	Broadcast Channel
CCCH	Common Control Channel
CCO	Cell Change Order
CP	Control Plane
C-RNTI	Cell RNTI
CSG	Closed Subscriber Group
DCCH	Dedicated Control Channel
DRB	(user) Data Radio Bearer
DRX	Discontinuous Reception
DTCH	Dedicated Traffic Channel
DL	Downlink
DL-SCH	Downlink Shared Channel
ETWS	Earthquake and Tsunami Warning System
E-UTRA	Evolved Universal Terrestrial Radio Access
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
ENB	Evolved Node B
EPC	Enhanced Packet Core
EPS	Enhanced Packet System
FLOOR	Mathematical function used to ‘round down’ i.e. to the nearest integer having a lower value
FDD	Frequency Division Duplex
FFS	For Further Study

GERAN	GSM/EDGE Radio Access Network
GSM	Global System for Mobile Communications
HARQ	Hybrid Automatic Repeat Request
HRPD	CDMA2000 High Rate Packet Data
IE	Information element
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
kB	Kilobyte (1000 bytes)
L1	Layer 1
L2	Layer 2
L3	Layer 3
MAC	Medium Access Control
MBMS	Multimedia Broadcast Multicast Service
MBSFN	Multimedia Broadcast multicast service Single Frequency Network
MIB	Master Information Block
N/A	Not Applicable
NACC	Network Assisted Cell Change
NAS	Non Access Stratum
PCCH	Paging Control Channel
PDU	Protocol Data Unit
PDCP	Packet Data Convergence Protocol
PLMN	Public Land Mobile Network
QoS	Quality of Service
RACH	Random Access CHannel
RAT	Radio Access Technology
RB	Radio Bearer
RLC	Radio Link Control
RNTI	Radio Network Temporary Identifier
RRC	Radio Resource Control
RSCP	Received Signal Code Power
RSRP	Reference Signal Received Power
RSSI	Received Signal Strength Indicator
SAE	System Architecture Evolution
SAP	Service Access Point
SI	Scheduling Information
SIB	System Information Block
SI-RNTI	System Information RNTI
SPS	Semi-Persistent Scheduling
SRB	Signalling Radio Bearer
S-TMSI	SAE Temporary Mobile Station Identifier
TA	Tracking Area
TDD	Time Division Duplex
TM	Transparent Mode
TPC-RNTI	Transmit Power Control RNTI
UE	User Equipment
UICC	Universal Integrated Circuit Card
UL	Uplink
UM	Unacknowledged Mode
UL-SCH	Uplink Shared Channel
UP	User Plane
UTRAN	Universal Terrestrial Radio Access Network

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

4 General

4.1 Introduction

This specification is organised as follows:

- sub-clause 4.2 describes the RRC protocol model;
- sub-clause 4.3 specifies the services provided to upper layers as well as the services expected from lower layers;
- sub-clause 4.4 lists the RRC functions;
- clause 5 specifies RRC procedures, including UE state transitions;
- clause 6 specifies the RRC message in a mixed format (i.e. tabular & ASN.1 together);
- clause 7 specifies the variables (including protocol timers and constants) and counters to be used by the UE;
- clause 8 specifies the encoding of the RRC messages.

4.2 Architecture

4.2.1 UE states and state transitions including inter RAT

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

- **RRC_IDLE**:
  - A UE specific DRX may be configured by upper layers.
  - UE controlled mobility;
  - The UE:
    - Monitors a Paging channel to detect incoming calls, system information change, and for ETWS capable UEs, ETWS notification;
    - Performs neighbouring cell measurements and cell (re-)selection;
    - Acquires system information.
- **RRC_CONNECTED**:
  - Transfer of unicast data to/from UE.
  - At lower layers, the UE may be configured with a UE specific DRX.
  - Network controlled mobility, i.e. handover and cell change order with network assistance (NACC) to GERAN;
  - The UE:
    - Monitors a Paging channel and/ or System Information Block Type 1 contents to detect system information change, and for ETWS capable UEs, ETWS notification;

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

    - Provides channel quality and feedback information;
    - Performs neighbouring cell measurements and measurement reporting;
    - Acquires system information.

The following figure not only provides an overview of the RRC states in E-UTRA, but also illustrates the mobility support between E-UTRAN, UTRAN and GERAN.

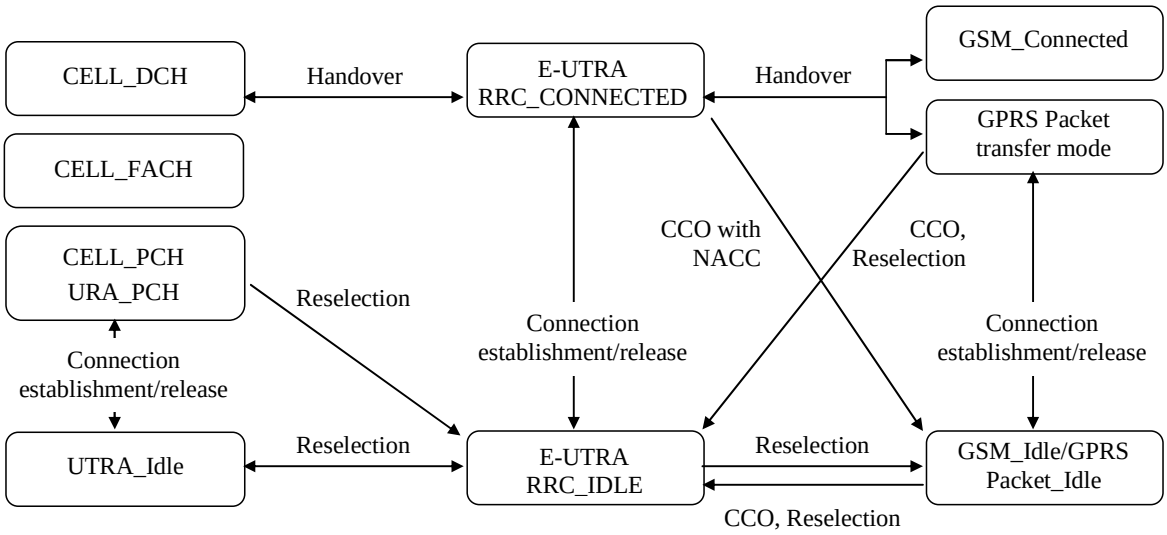

Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP

The following figure illustrates the mobility support between E-UTRAN, CDMA2000 1xRTT and CDMA2000 HRPD. The details of the CDMA2000 state models are out of the scope of this specification.

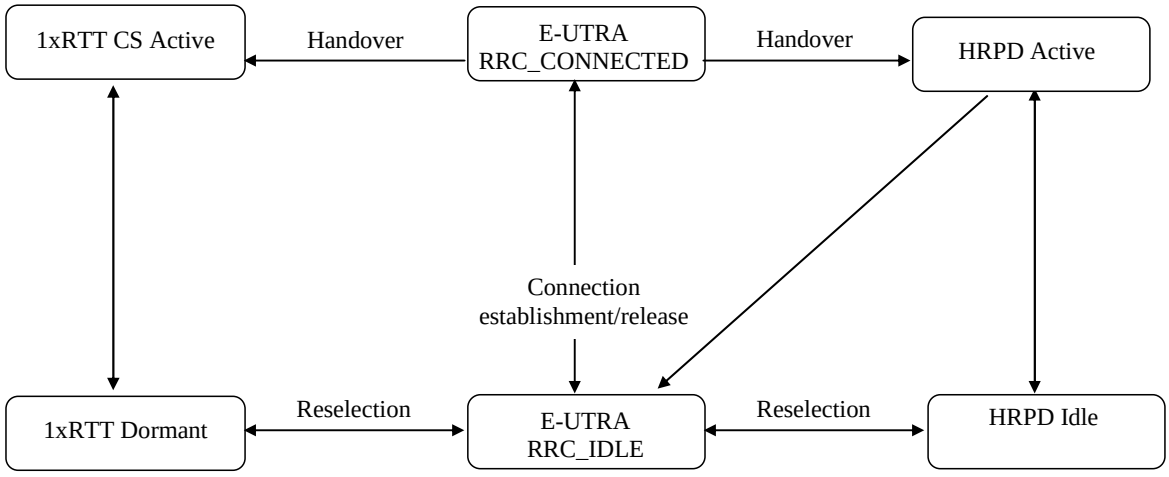

Figure 4.2.1-2: Mobility procedures between E-UTRA and CDMA2000

Editor's note: In Fig. 4.2.1-2, the procedure name is missing for some transitions. Terminology to be added is FFS.

The inter-RAT handover procedure(s) supports the case of signalling, conversational services (including a “voice call continuity” procedure [FFS depending on SA2 discussions]), 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, Idle/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 a NAS or a non-3GPP message, 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 general control information;
- Notification of UEs in RRC_IDLE, e.g. about a terminating call, for ETWS;
- Transfer of dedicated control information, i.e. information for one specific UE.

4.3.2 Services expected from lower layers

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

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

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

4.4 Functions

The RRC protocol includes the following main functions:

- Broadcast of system information:
  - Including NAS common information;

Editor's note: It seems there is no NAS common information anymore

  - Information applicable for UEs in RRC_IDLE, e.g. cell (re-)selection parameters, neighbouring cell information and information (also) applicable for UEs in RRC_CONNECTED, e.g. common channel configuration information.
  - Including ETWS notification;
- RRC connection control:

- Paging;
- Establishment/ modification/ release of RRC connection, including e.g. assignment/ modification of UE identity (C-RNTI), establishment/ modification/ release of SRB1 and SRB2, access class barring;
- Initial security activation, i.e. initial configuration of AS integrity protection (CP) and AS ciphering (CP, UP);
- 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);
  - Configuration and (de-)activation 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' i.e. 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 section other (5.6) that covers e.g. NAS dedicated information transfer, UE capability transfer. Finally, section 5.7 specifies the general 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: E-UTRAN may initiate a subsequent procedure prior to receiving the UEs response of a previously initiated procedure.

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;

Editor's note: The above is based on the following working assumptions: a) so far no need has been identified for an activation time, b) for procedure completion there is not need to wait for an L2 ACK

Editor's note: The UE can only initiate the UL information transfer procedure while in RRC_CONNECTED, i.e. this does not include the transient states while the UE is waiting for a response to connection request or a connection re-establishment request.

Editor's note: The UE continuously ongoing actions in idle and connected (i.e. normative versions of the statements in 4.2.1) are specified within the respective sections, e.g. system information, paging (36.304), measurements. Same applies for the actions upon state transitions.

To be completed

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 *schedulingInformation* 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 *schedulingInformation*. There may be multiple SI messages transmitted with the same periodicity. *SystemInformationBlockType1* and all SI messages are transmitted on DL-SCH.

5.2.1.2 Scheduling

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

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

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

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

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

5.2.1.3 System information validity and notification of changes

Change of system information (other than for ETWS) only occurs at specific radio frames, i.e. the concept of a modification period is used. System information may be transmitted a number of times with the same content within a modification period, as defined by its scheduling. The modification period boundaries are defined by SFN values for which SFN mod *modificationPeriod*= 0. The *modificationPeriod* 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 knows that the current system information is valid until the next modification period boundary. After this boundary, the UE acquires the new system information.

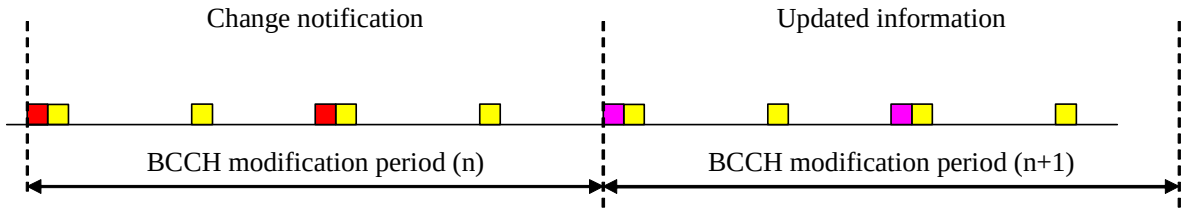

Figure 5.2.1.3-1: Change of system Information

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

SystemInformationBlockType1 includes a value tag that indicates if a change has occurred in the SI messages. UEs may use this value tag, e.g. upon return from out of coverage, to verify if the previously acquired SI messages are still valid. The UE considers system information to be valid for at most 3 hours from the moment it was received.

E-UTRAN may not update the value tag upon change of some system information e.g. ETWS information, regularly changing parameters like CDMA 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 acquired system information remains valid either by checking the value tag in *SystemInformationBlockType1* after the modification period boundary or, by attempting to find the *systemInfoModification* indication at least *modificationPeriodCoeff* times during a modification period in case no paging is received. 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 will occur in the next modificationPeriod 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 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 *schedulingInformation* contained in *SystemInformationBlockType1*. ETWS primary notification is contained in *SystemInformationBlockType10* and ETWS secondary notification is contained in *SystemInformationBlockType11*.

Editor's note: The details of when the ETWS capable UEs read paging in RRC_CONNECTED is FFS.

5.2.2 System information acquisition

5.2.2.1 General

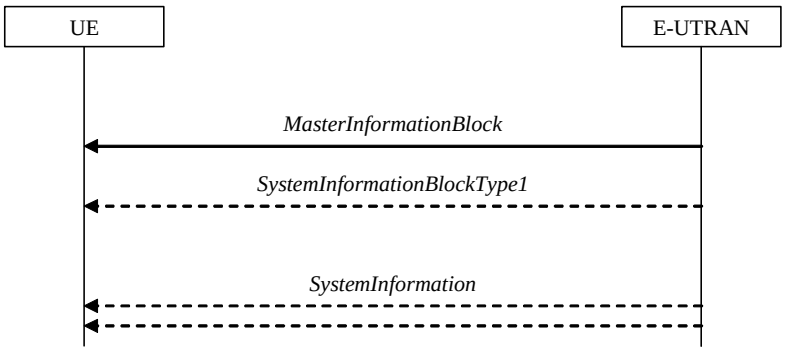

Figure 5.2.2.1-1: System information acquisition, normal

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 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.

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

1> consider any stored system information to be invalid if it was received more than 3 hours ago;

1> consider any stored system information to be invalid if the value tag 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 the system information required in RRC_IDLE, as defined in 5.2.3.

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 the system information required in RRC_CONNECTED, as defined in 5.2.3;

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 CDMA upper layers:

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

1> not initiate the RRC connection establishment or RRC connection re-establishment procedure 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> maintain, if any, stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType10* (i.e. they shall not be cleared);

3> discard any previously buffered *warningMessageSegment*;

3> if stored values of *messageIdentifier* and *serialNumber* have not changed since the UE has last forwarded a complete *warningMessage* to upper layers:

4> maintain stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*;

3> else:

4> clear, if any, stored 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 and upon connection re-establishment:

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

4> start acquiring *SystemInformationBlockType10* immediately;

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

4> start acquiring *SystemInformationBlockType11* immediately;

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

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

NOTE 3: While attempting to acquire a particular SIB, if the UE detects from *schedulingInformation* 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> the cell does not transmit or the UE assumes it is unable to acquire the *MasterInformationBlock*, the *SystemInformationBlockType1* or the *SystemInformationBlockType2*:

2> Consider the cell to be 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-Configuration*;

1> if the UE is in RRC_IDLE or if UE has received the *MasterInformationBlock* in order to perform the re-establishment procedure:

2> if the UE has no valid system information stored according to 5.2.2.3 for the cell in which the *MasterInformationBlock* is received:

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> forward the *cellIdentity* to upper layers;

1> 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-SubframeConfiguration* is included:

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

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

1> apply the specified PCCH configuration defined in 9.1.1.3;

1> not apply the *timeAlignmentTimerCommon*;

5.2.2.10 Actions upon reception of *SystemInformationBlockType3*

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

5.2.2.11 Actions upon reception of *SystemInformationBlockType4*

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

5.2.2.12 Actions upon reception of *SystemInformationBlockType5*

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

5.2.2.13 Actions upon reception of *SystemInformationBlockType6*

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

5.2.2.14 Actions upon reception of *SystemInformationBlockType7*

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

5.2.2.15 Actions upon reception of *SystemInformationBlockType8*

Upon receiving *SystemInformationBlockType8*, the UE shall:

1> if the *CDMA2000-SystemTimeInfo* is included:

2> forward the *CDMA2000-SystemTimeInfo* to CDMA upper layers;

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

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

1> if *hrpd-Parameters* is included;

2> if the *hrpd-PreRegistrationInfo* is included and the UE has not received it within a *RRCConnectionReconfiguration* message after entering this cell:

3> forward the *hrpd-PreRegistrationInfo* to CDMA upper layers;

2> if the *hrpd-CellReselectionParameters* is included:

3> if the *hrpd-NeighborCellList* is included:

4> forward the *hrpd-NeighborCellList* to the CDMA upper layers;

1> if the *oneXRTT-Parameters* is included:

2> if the *oneXRTT-CSFBRegistrationInfo* is included:

3> forward the *oneXRTT-CSFBRegistrationInfo* to the CDMA upper layers and only use this information for CS registration towards 1xRTT in the EUTRA cell in which it was received;

2> if the *oneXRTT-LongCodeState* is included:

3> forward the *oneXRTT-LongCodeState* to CDMA upper layers;

2> if the *oneXRTT-CellReselectionParameters* is included:

3> if the *oneXRTT-NeighborCellList* is included:

4> forward the *oneXRTT-NeighborCellList* to the CDMA upper layers;

5.2.2.16 Actions upon reception of *SystemInformationBlockType9*

Upon receiving *SystemInformationBlockType9*, the UE shall:

1> forward the hnbid to upper layers;

5.2.2.17 Actions upon reception of *SystemInformationBlockType10*

Upon receiving *SystemInformationBlockType10*, the UE shall:

1> if no value is yet stored for *messageIdentifier* and *serialNumber* for *SystemInformationBlockType10*; or

1> if either the received value of *messageIdentifier* or of *serialNumber* or of both are different from the stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType10*:

2> store the received values of *messageIdentifer* and *serialNumber* for *SystemInformationBlockType10*;

2> forward the received *warningType* and *warningSecurityInformation* (if present) to upper layers;

1> else:

2> discard the received *SystemInformationBlockType10* contents.

5.2.2.18 Actions upon reception of *SystemInformationBlockType11*

Upon receiving *SystemInformationBlockType11*, the UE shall:

1> if no value is yet stored 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 stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*:

2> store the received values of *messageIdentifer* and *serialNumber* for *SystemInformationBlockType11*;

2> discard any previously buffered *warningMessageSegment*;

2> if all *warningMessageSegment* are now received:

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

3> stop reception of *SystemInformationBlockType11*;

2> else:

3> continue reception of *SystemInformationBlockType11*;

1> else if both the stored values of *messageIdentifier* and *serialNumber* have not changed since the UE has last forwarded a complete *warningMessage* to upper layers:

2> discard the received *SystemInformationBlockType11* contents;

2> stop reception of *SystemInformationBlockType11*;

1> else if all the *warningMessageSegment* are now received:

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

2> stop reception of *SystemInformationBlockType11*;

1> else:

2> continue reception of *SystemInformationBlockType11*.

5.2.3 Acquisition of an SI message

When acquiring an SI message, the UE shall:

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

2> for the concerned SI message, determine the number *n* which corresponds to the order of entry in the list of SI messages configured by *schedulingInformation* 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 1ms only if all SIs are scheduled before sub-frame #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 is 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 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.

5.3.1.2 Security

AS security comprises of the integrity protection of RRC signalling as well as the encryption of RRC signalling and user data.

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). Use of a 'NULL' integrity protection algorithm is FFS.

NOTE 1 Security is always activated although in some cases a 'NULL' algorithm may be used, e.g. in case of UICC-less emergency calls

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

The AS applies three different security keys: one for the integrity protection of RRC signalling (K_{RRCint}), one for the encryption of RRC signalling (K_{RRCenc}) and one for the encryption of user data (K_{UPenc}). All three AS keys are derived from the K_{eNB} key.

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.

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 [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 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 (SN). In addition, an overflow counter mechanism is used: the hyper frame number (HFN). 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.

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). 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.

For mobility within E-UTRA, handover is the only procedure that is defined. 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, 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 [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 [8].

Editor's note: W.r.t. handover there is one UE behaviour regardless of the handover procedures used within the network (e.g. whether the handover includes X2 or S1 signalling procedures).

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

5.3.2 Paging

5.3.2.1 General

Figure 5.3.2.1-1: Paging

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

5.3.2.2 Initiation

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

5.3.2.3 Reception of the *Paging* message by the UE

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

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

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

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

1> if the *systemInfoModification* is included:

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

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

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

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

3> acquire SystemInformationBlockType10;

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

3> acquire *SystemInformationBlockType11*;

5.3.3 RRC connection establishment

5.3.3.1 General

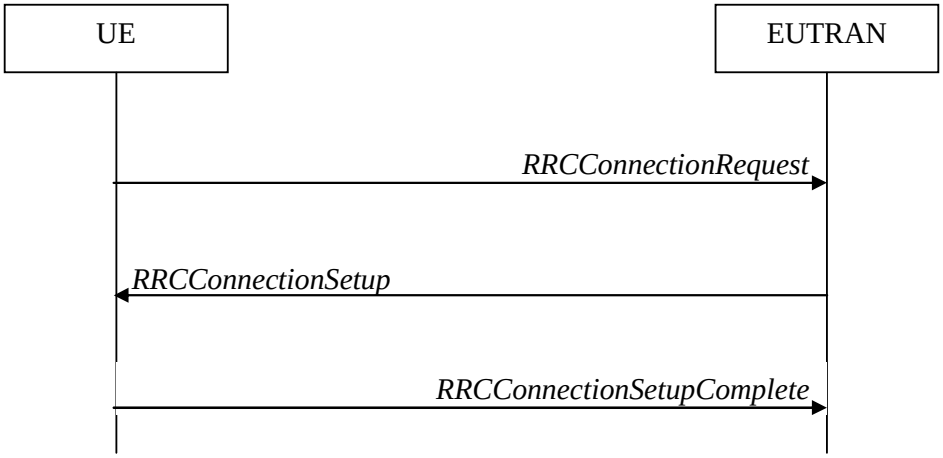

Figure 5.3.3.1-1: RRC connection establishment, successful

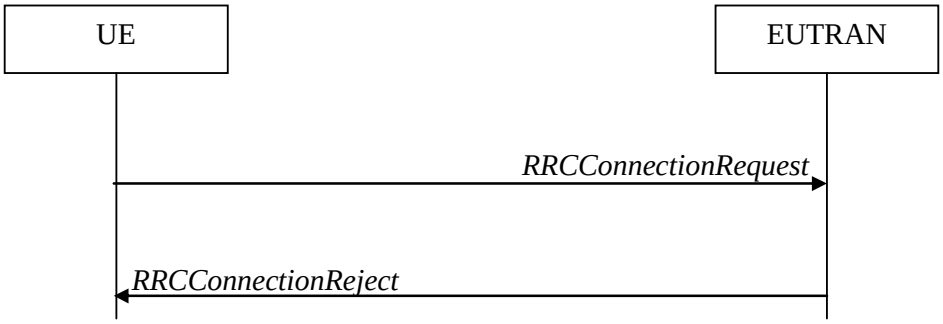

Figure 5.3.3.1-2: RRC connection establishment, network reject

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

E-UTRAN applies the procedure as follows:

- to establish SRB1 only.

5.3.3.2 Initiation

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

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 *accessBarringInformation*:

3> if the *accessBarringForEmergencyCalls* 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 *accessBarringInformation* includes *accessBarringForOriginatingCalls*, and for all of the valid Access Classes for the UE, the *accessClassBarring* in the *accessClassBarringList* contained in *accessBarringForOriginatingCalls* is set to *TRUE*:

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 *accessBarringInformation* and the *accessBarringForOriginatingCalls* 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 *accessClassBarring* in the *accessClassBarringList* contained in *accessBarringForOriginatingCalls* is set to *FALSE*:

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 *accessProbabilityFactor* included in *accessBarringForOriginatingCalls*:

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 *accessBarringInformation* and the *accessBarringForSignalling* 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 *accessClassBarring* in the *accessClassBarringList* contained in *accessBarringForSignalling* is set to *FALSE*:

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 *accessProbabilityFactor* included in *accessBarringForSignalling*:

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, until explicitly receiving a configuration;

2> apply the default semi-persistent scheduling configuration as specified in 9.2.3, until explicitly receiving a configuration;

2> apply the default MAC main configuration as specified in 9.2.2, until explicitly receiving a configuration;

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 *accessBarringTime* included in *accessBarringForOriginatingCalls*:

T303= $(0.7 + 0.6 * rand) * accessBarringTime$

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 *accessBarringTime* included in *accessBarringForSignalling*:

T305= (0.7+ 0.6 * *rand*) * *accessBarringTime*

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 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> establish SRB1 in accordance with the received *radioResourceConfiguration* and as specified in 5.3.10;

1> if stored, discard the Inter-frequency priority information and the Inter-RAT priority information provided by dedicated signalling using *idleModeMobilityControlInfo*;

1> stop timer T300;

1> stop timer T302, if running;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> stop timer T320, if running;

1> enter RRC_CONNECTED state;

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 [TS 23.122, TS 24.008] from the PLMN(s) included in the *plmn-IdentityList* in *SystemInformationBlockType1*, in the cell where the RRC connection was established;

2> if upper layers provide the 'Registered MME', 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 *nas-DedicatedInformation* 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

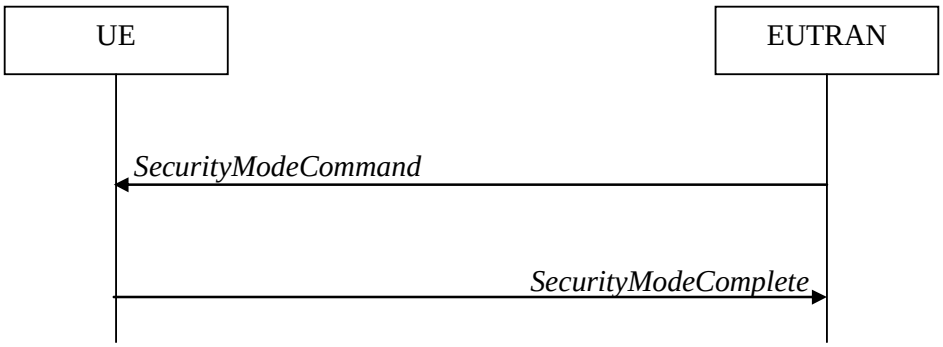

Figure 5.3.4.1-1: Security mode command, successful

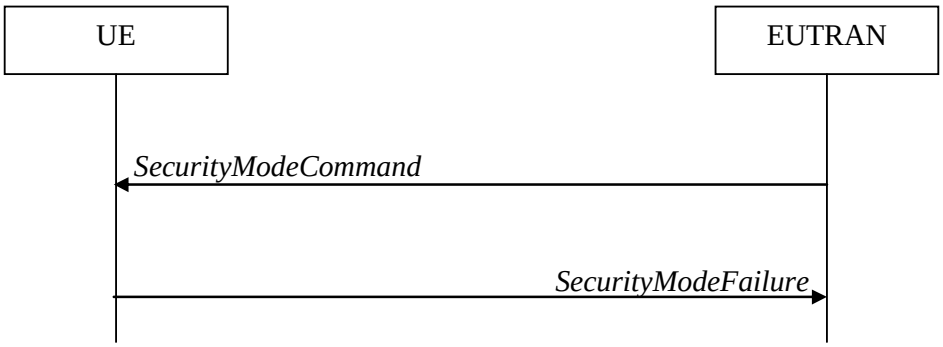

Figure 5.3.4.1-2: Security mode command, failure

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 [32];

1> derive the K_{RRCint} key associated with the *integrityProtAlgorithm* indicated in the *SecurityModeCommand* message, as specified in [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> store the *nextHopChainingCount* value received by the *SecurityModeCommand* message;

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

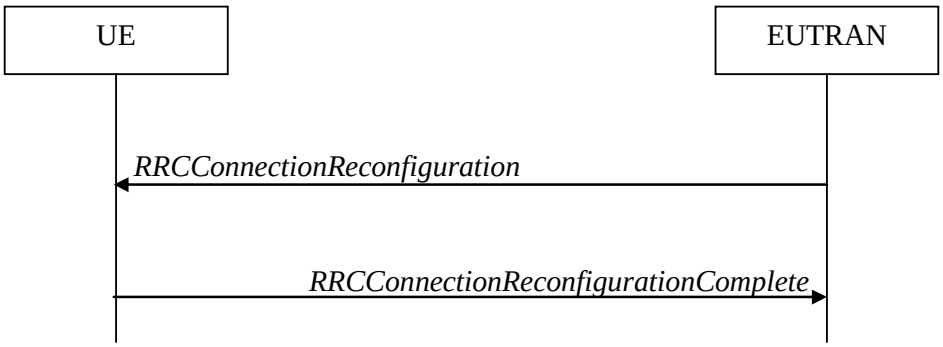

Figure 5.3.5.1-1: RRC connection reconfiguration, successful

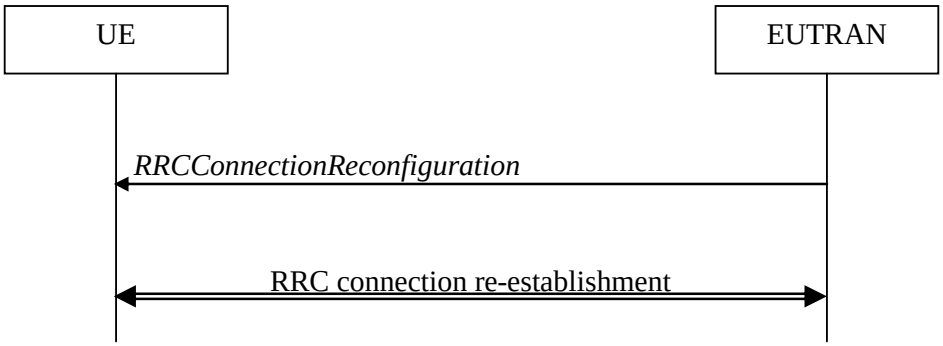

Figure 5.3.5.1-2: RRC connection reconfiguration, failure

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 *mobilityControlInformation* is included only when AS-security has been activated;
- 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 a *RRCConnectionReconfiguration* not including the *mobilityControlInformation* by the UE

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInformation* 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 *radioResourceConfiguration*:

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 [8].

1> else:

2> If the *RRCConnectionReconfiguration* message includes the *radioResourceConfiguration*:

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 *nas-DedicatedInformationList*:

2> forward each element of the *nas-DedicatedInformationList* to upper layers;

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

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 a *RRCConnectionReconfiguration* including the *mobilityControlInformation* by the UE (handover)

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.

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInformation* 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 *mobilityControlInformation*;

1> if the *eutra-CarrierFreq* is included:

2> consider the target cell to be one on the frequency indicated by the *eutra-CarrierFreq* with a physical cell identity indicated by the *targetCellIdentity*;

1> else:

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

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

NOTE 2: The UE applies the new configuration, resulting after the following actions, upon switching to the target cell.

1> reset MAC;

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

NOTE 3: 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 [8].

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

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

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

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

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

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

2> update the K_{eNB} key based on the latest available K_{ASME} key, as specified in [32];

1> else:

2> 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 *securityConfiguration*, as specified in [32];

1> store the *nextHopChainingCount* value;

1> if the *integrityProtAlgorithm* is included in the *securityConfiguration*:

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

1> else:

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

1> if the *cipheringAlgorithm* is included in the *securityConfiguration*:

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

1> else:

2> derive the K_{RRCenc} key and the K_{UPenc} key associated with the current ciphering algorithm, as specified in [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 *measurementConfiguration*:

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> If MAC successfully completes the random access procedure:

2> stop timer T304;

2> if the UE needs the SFN of the target cell to apply the PUCCH and Sounding RS configuration:

3> apply the PUCCH and Sounding RS configuration upon acquiring the SFN of the target cell;

2> else:

3> apply the PUCCH and Sounding RS configuration;

2> the procedure ends.

Editor's note: It has been agreed that 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 there is an ASN.1 violation in the *RRCConnectionReconfiguration* 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 dedicated preambles, if provided within the *rach-ConfigDedicated*, are 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-Configuration*;

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

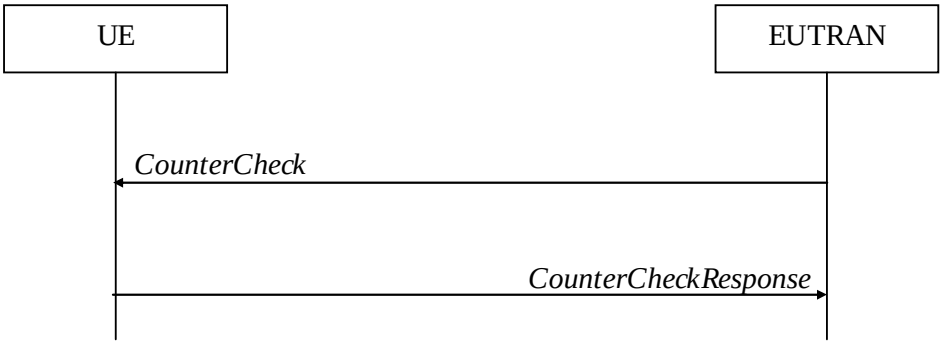

Figure 5.3.6.1-1: Counter check procedure

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 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

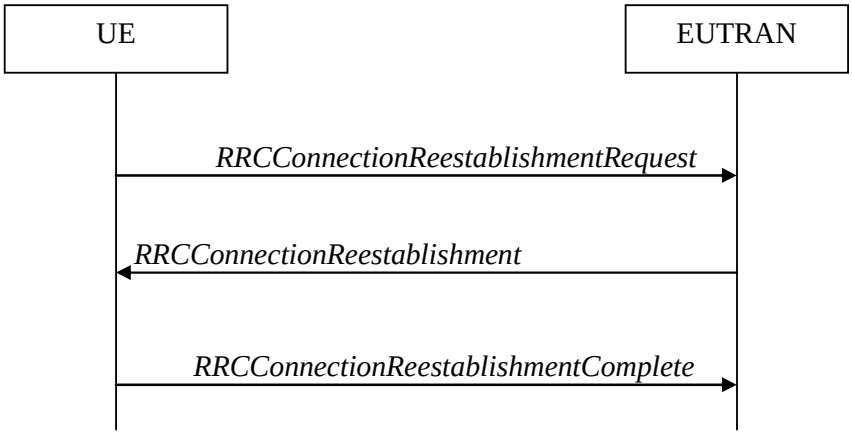

Figure 5.3.7.1-1: RRC connection re-establishment, successful

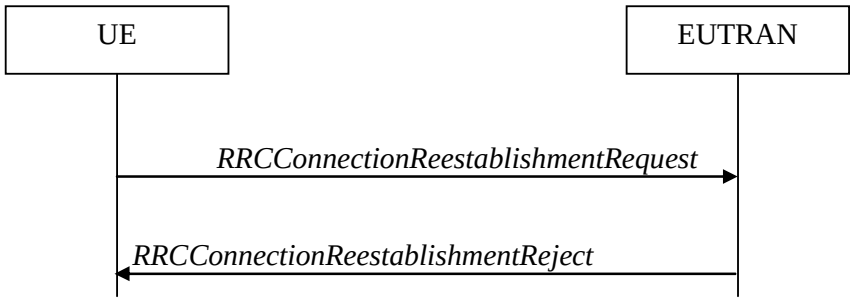

Figure 5.3.7.1-2: RRC connection re-establishment, failure

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> after having detected 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> 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 failure case) or used in the cell in which the trigger for the re-establishment occurred (other cases);

2> set the physC*ellIdentity* to the physical cell identity of the source cell (handover failure case) 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 *VarShortMAC-Input*;

3> with the K_{RRCint} key and integrity protection algorithm that was used in the cell the UE was connected to prior to the failure; 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> resume SRB1 after reconfiguring it in accordance with the received *radioResourceConfiguration* as specified in 5.3.10;

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 [32];

1> store the *nextHopChainingCount* value;

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

1> derive the K_{RRCenc} key and the K_{UPenc} key associated with the previously configured ciphering algorithm, as specified in [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> send the *RRCConnectionReestablishmentComplete* message as specified in 5.3.7.6;

5.3.7.6 Actions related to transmission of *RRCConnectionReestablishmentComplete* message

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

5.3.7.7 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'.

5.3.7.8 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], the UE shall:

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

5.3.7.9 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

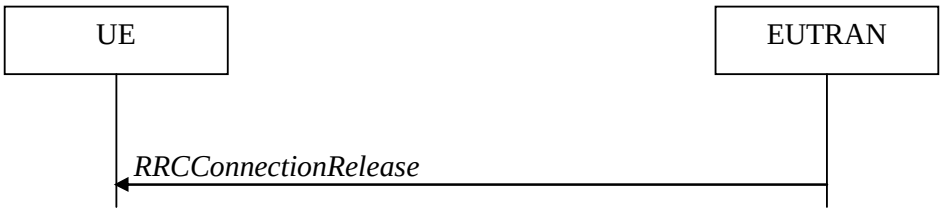

Figure 5.3.8.1-1: RRC connection release, successful

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 60ms 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 *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> use the idle mobility parameters 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> discard the cell reselection priority information provided by dedicated signalling, i.e. using *idleModeMobilityControlInfo*;

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 and to bar access to the current cell.

NOTE: Upper layers invoke the procedure 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> consider the cell used prior to entering RRC_IDLE to be barred according to TS 36.304 [4] for a period of 300s.

5.3.10 Radio resource configuration

5.3.10.1 SRB addition/ modification

The UE shall:

1> if the received *radioResourceConfiguration* includes the *srb-ToAddModifyList*:

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

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

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

3> if the *rlc-Configuration* is set to '*explicitValue*':

4> establish an RLC entity in accordance with the received *RLC-Configuration*;

3> else if the *rlc-Configuration* is set to '*defaultValue*':

4> establish an RLC entity in accordance with the default configuration applicable for this *srb-Identity* as specified in 9.2.1;

3> if the *logicalChannelConfig* is set to '*explicitValue*':

4> establish a DCCH logical channel in accordance with the received *LogicalChannelConfig*;

3> else if the *logicalChannelConfig* is set to '*defaultValue*':

4> establish a DCCH logical channel in accordance with the default configuration applicable for this *srb-identity* as specified in 9.2.1;

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

3> if the *rlc-Configuration* is included and set to '*explicitValue*':

4> reconfigure the RLC entity in accordance with the received *RLC-Configuration*;

3> else if the *rlc-Configuration* is included and set to '*defaultValue*':

4> reconfigure the RLC entity in accordance with the default configuration applicable for this *srb-Identity* as specified in 9.2.1.1;

3> if the *logicalChannelConfig* is included and set to '*explicitValue*':

4> reconfigure the DCCH logical channel in accordance with the received *LogicalChannelConfig*;

3> else if the *logicalChannelConfig* is included and set to '*defaultValue*':

4> reconfigure the DCCH logical channel in accordance with the default configuration applicable for this *srb-Identity* as specified in 9.2.1;

NOTE 1: 'Infinity' is the only applicable value for the *prioritizedBitRate* for SRB1 and SRB2

NOTE 2: RLC AM is the only applicable RLC mode for SRB1 and SRB2

5.3.10.2 DRB release

The UE shall:

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

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

3> release the PDCP entity;

3> release the RLC entity;

3> release the DTCH logical channel;

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

5.3.10.3 DRB addition/ modification

The UE shall:

1> if the received *radioResourceConfiguration* includes the *drb-ToAddModifyList*:

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

3> establish a PDCP entity and configure it with the current security configuration and in accordance with the received *PDCP-Configuration*;

3> establish an RLC entity in accordance with the received *RLC-Configuration*;

3> establish a DTCH logical channel in accordance with the received *LogicalChannelConfig*;

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

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

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

3> reconfigure the RLC entity in accordance with the received *RLC-Configuration*;

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

5.3.10.4 MAC main reconfiguration

The UE shall:

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

2> if the *mac-MainConfig* is set to '*explicitValue*':

3> if the received *mac-MainConfig* includes the *dl-SCH-Configuration*:

4> reconfigure the DL-SCH transport channel in accordance with the received *dl-SCH-Configuration*;

3> if the received *mac-MainConfig* includes the *ul-SCH-Configuration*:

4> reconfigure the UL-SCH transport channel in accordance with the received *ul-SCH-Configuration*;

3> if the *mac-MainConfig* includes *drx-Configuration*:

4> if the *drx-Configuration* is set to 'disable':

5> disable the DRX functionality;

5> release the DRX configuration.

4> else if the *drx-Configuration* includes *shortDRX* and *shortDRX* is set to *'disable'*:

5> disable the short DRX functionality;

5> release short DRX configuration;

3> apply the *timeAlignmentTimerDedicated*;

3> if the *mac-MainConfig* includes *phr-Configuration*:

4> if the *phr-Configuration* is set to '*disable*':

5> disable the power headroom reporting functionality;

2> else if the *mac-MainConfig* is set to '*defaultValue*':

3> reconfigure the *mac-MainConfig* in accordance with the default configuration as specified in 9.2.2.

5.3.10.5 Semi-persistent scheduling reconfiguration

The UE shall:

1> if the received *radioResourceConfiguration* includes *sps-Configuration*:

2> if *sps-Configuration* includes *sps-ConfigurationDL* and the configuration is set to '*disable*':

3> deactivate any downlink semi-persistent scheduling resources, if active;

3> release the downlink semi-persistent scheduling configuration.

2> if *sps-Configuration* includes *sps-ConfigurationUL* and the configuration is set to '*disable*':

3> deactivate any uplink semi-persistent scheduling resources, if active;

3> release the uplink semi-persistent scheduling configuration.

5.3.10.6 Physical channel reconfiguration

The UE shall:

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

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

2> if the *antennaInformation* is included and set to '*explicitValue*':

3> reconfigure the antenna configuration in accordance with the received *AntennaInformationDedicated*;

2> else if the *antennaInformation* is included and set to '*defaultValue*':

3> reconfigure the antenna configuration in accordance with the default configuration for *AntennaInformationDedicated* as specified in 9.2.4;

2> if *physicalConfigDedicated* includes *cqi-Reporting* and *cqi-Reporting* includes *cqi-ReportingPeriodic* and the configuration is set to '*disable*':

3> deactivate any uplink resources used for periodic CQI reporting, if active;

3> release the *cqi-ReportingPeriodic* configuration;

2> if *physicalConfigDedicated* includes the *soundingRsUl-Config* and the configuration is set to '*disable*':

3> deactivate any uplink resources used for sounding if active;

3> release the *soundingRsUl-Config* configuration.

2> if *physicalConfigDedicated* includes the *schedulingRequestConfig* and the configuration is set to '*disable*':

3> deactivate any uplink resources used for scheduling request, if active;

3> release the *schedulingRequestConfig* configuration.

5.3.11 Radio link failure related actions

5.3.11.1 Detection of physical layer problems

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

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 and re-establish RLC for all RBs that are established;

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 notification

Upon notificication of PUCCH/ SRS Release from lower layers, the UE shall:

1> deactivate any uplink resources used for periodic CQI Reporting, if active;

1> release the *CQI-Reporting* configuration;

1> deactivate any uplink resources used for sounding if active;

1> release the *soundingRsUl-Config* configuration;

1> deactivate any uplink resources used for scheduling request, if active;

1> release the *schedulingRequestConfig* configuration;

1> release the *pucch-Configuration* configuration.

5.4 Inter-RAT mobility

5.4.1 Introduction

The general principles of connected mode mobility are described in 5.3.1.3. 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.

For inter RAT mobility from E-UTRA a single procedure is defined that supports both handover and cell change order with optional network assistance (NACC).

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

NOTE The mobility procedures between E-UTRA and UTRAN are based on the assumption that handover to E-UTRA is performed only after integrity protection has been activated in UTRAN

5.4.2 Handover to E-UTRA

5.4.2.1 General

Editor's note: It may be desirable to avoid, to some extend, duplication of specification for parts that are common for the regular RRC connection reconfiguration procedure and the inter RAT handover case.

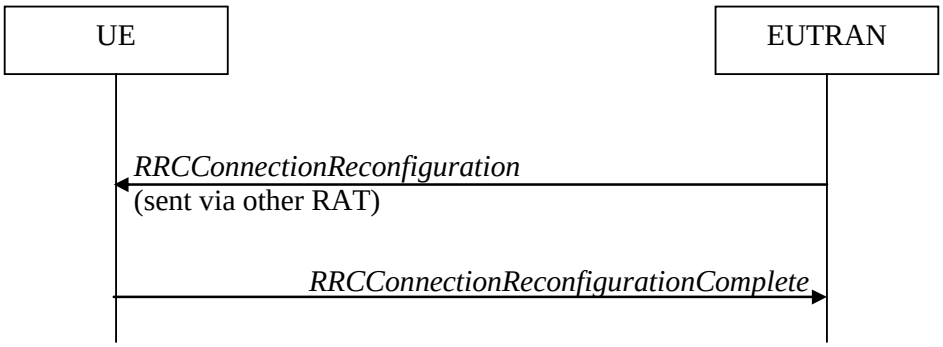

Figure 5.4.2.1-1: Handover to E-UTRA, successful

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

1> consider the target cell to be one on the frequency indicated by the *eutra-CarrierFreq* with a physical cell identity indicated by the *targetCellIdentity*;

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

NOTE: The UE applies the new configuration, resulting after the following actions, upon switching to 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 *ul-Bandwidth;*

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

1> derive the K_{RRCint}, the K_{RRCenc} and the K_{UPenc} keys;

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 *measurementConfiguration*:

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> if MAC successfully completes the random access procedure:

2> stop timer T304;

2> if the UE needs the SFN of the target cell to apply the PUCCH and sounding RS configuration:

3> apply the new PUCCH and sounding RS configuration upon acquiring the SFN of the target cell;

2> else:

3> apply the new PUCCH and sounding RS configuration;

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: 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

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

- handover, i.e. the *MobilityFromEUTRACommand* message includes radio resources that have been allocated for the UE in the target cell; and
- cell change order, i.e. the *MobilityFromEUTRACommand* message may include information facilitating access of and/ or connection establishment in the target cell, e.g. system information. Cell change order is applicable only to GERAN.

The mobility from E-UTRA procedure applies when SRBs are established, possibly in combination with DRBs.

5.4.3.2 Initiation

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

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 '*utran*' or '*geran*':

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

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

NOTE: If there are DRBs for which no radio bearers have been established in the target RAT as indicated in the *targetRAT-MessageContainer* in the message, the target RAT part of the UE indicates the release of those DRBs to the upper layer.

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 CDMA upper layers for the UE to access the cell indicated in the inter-RAT message in accordance with the specifications of the CDMA 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 *CellChangeOrder* 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].

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

5.4.3.4 Successful completion of the mobility from E-UTRA

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

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

1> stop timer T304, if running.

5.4.3.5 Mobility from E-UTRA failure

The UE shall:

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

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

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

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

2> stop T304, if running;

2> if the *MobilityFromEUTRACommand* message included the *csFallbackIndicator:*

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*, the *mac-MainConfig* and the *sps-Configuration*;

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

5.4.4 Handover from E-UTRA preparation request (CDMA2000)

5.4.4.1 General

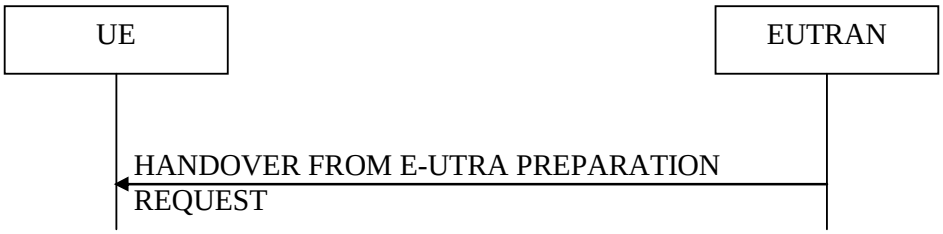

Figure 5.4.4.1-1: Handover from E-UTRA preparation request

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

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

5.4.4.2 Initiation

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

5.4.4.3 Reception of the *HandoverFromEUTRAPreparationRequest* by the UE

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

1> indicate the request to prepare handover and forward the *cdma2000-Type* and the *cdma2000-MobilityParameters*, if present, to the CDMA upper layers;

1> if cdma2000-Type = type1XRTT forward the cdma2000-RAND to the CDMA upper layers.

5.4.5 UL handover preparation transfer (CDMA2000)

5.4.5.1 General

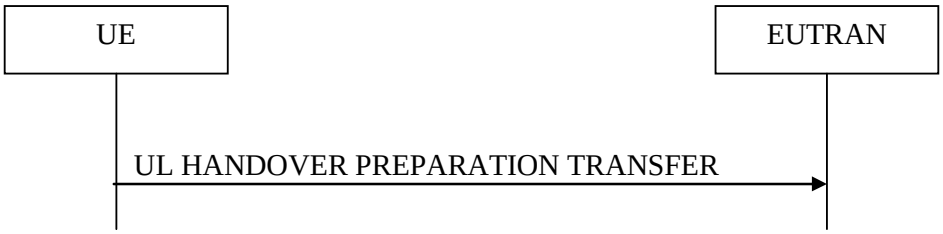

Figure 5.4.5.1-1: UL handover preparation transfer

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

5.4.5.2 Initiation

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

5.4.5.3 Actions related to transmission of the *ULHandoverPreparationTransfer* message

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

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

1> if the *cdma2000-Type = type1XRTT*:

2> include the *cdma2000-MEID* and set it to the value received from the CDMA2000 upper layers.

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.

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> initiate an RRC connection establishment procedure as specified in subclause 5.3.3.

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.

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 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 for intra-frequency measurements, one for inter-frequency measurements and one 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 measurement objects are specified per RAT type, with the E-UTRA measurement object list including both the intra-frequency object (i.e. the object corresponding to the serving frequency) and the inter-frequency object(s). The reporting configuration includes separate lists for E-UTRA and for inter-RAT reporting configurations. The E-UTRA reporting configuration list includes both intra- and inter-frequency reporting configurations (and events). There is a single measurement identities list. Any E-UTRA measurement object can be linked to any E-UTRA reporting configuration. Some E-UTRA reporting configurations may not be linked to a measurement object. Likewise, some E-UTRA measurement objects may not be linked to an E-UTRA reporting configuration. The same rules apply for the linking of inter-RAT measurement objects and inter-RAT reporting configurations.

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).

5.5.2 Measurement configuration

5.5.2.1 General

E-UTRAN applies the procedure as follows:

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

The UE shall:

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

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

1> if the received *measurementConfiguration* includes the *measObjectToAddModifyList*:

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

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

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

1> if the received *measurementConfiguration* includes the *reportConfigToAddModifyList*:

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

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

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

1> if the received *measurementConfiguration* includes the *measIdToAddModifyList*:

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

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

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

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

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

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

2> set the parameter *s-Measure* within *VarMeasurementConfiguration* to the received value of *s-Measure*;

1> if the *hrpd-PreRegistrationInfo* is included:

2> forward the *hrpd-PreRegistrationInfo* to CDMA upper layers;

1> if the received *measurementConfiguration* includes the *neighbourCellConfiguration*:

2> set the parameter *neighbourCellConfiguration* within *VarMeasurementConfiguration* to the received value of *neighbourCellConfiguration*;

1> if the received *measurementConfiguration* includes the *speedDependentParameters*:

2> set the parameter *speedDependentParameters* within *VarMeasurementConfiguration* to the received value of *speedDependentParameters*.

5.5.2.2 Measurement identity removal

The UE shall:

1> for each *measId* value included in the *measIdToRemoveList*:

2> remove the entry, from the parameter *measIdList* within *VarMeasurementConfiguration*, with the corresponding *measId* value;

2> remove the entry within the *VarMeasurementReports* for this *measId*, if included;

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

5.5.2.3 Measurement identity addition/ modification

E-UTRAN applies the procedure as follows:

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

The UE shall:

1> for each *measId* value included in the *measIdToAddModifyList*:

2> if an entry is included in the parameter *measIdList* within *VarMeasurementConfiguration* with the corresponding *measId* value:

3> set the entry with the corresponding *measId* value within *VarMeasurementConfiguration* to the corresponding entry of the received parameter *measIdToAddModifyList*;

2> else:

3> add the entry with the corresponding *measId* value to the *VarMeasurementConfiguration* and set it to the corresponding entry of the received parameter *measIdToAddModifyList*;

2> remove the entry within in *VarMeasurementReports* with a corresponding *measId* value, if included;

2> reset the periodical reporting timer or timer T321, whichever one is running, as well as 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 corresponding *reportConfig* within *VarMeasurementConfiguration*:

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 *measObjId* value included in the *MeasObjectToRemoveList*:

2> remove, from the parameter *MeasObjectList* within *VarMeasurementConfiguration*, the entry with the corresponding *measObjId* value;

2> remove, from the parameter *measIdList* within *VarMeasurementConfiguration*, the entry(ies) with the corresponding *measObjId* value, if included;

2> if an entry is removed from the *measIdList* within *VarMeasurementConfiguration:*

3> remove the entry within the *VarMeasurementReports* for this *measId*, if included;

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

5.5.2.5 Measurement object addition/ modification

The UE shall:

1> for each *measObjId* value included in the *measObjectToAddModifyList*:

2> if an entry is included in the parameter *measObjectList* within *VarMeasurementConfiguration* with the corresponding *measObjId* value:

3> for all IEs, other than the *cellsToAddModifyList*, the *blacklistedCellsToAddModifyList, the cellsToRemoveList* and the *blackListedCellsToRemoveList* of the corresponding measurement object within *VarMeasurementConfiguration*:

4> set the entry with the corresponding *measObjId* value within *VarMeasurementConfiguration* to the corresponding entry of the received parameter *measObjectToAddModifyList*;

3> if the concerned received measurement object includes the *cellsToRemoveList*:

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

5> remove, from the parameter *cellsToAddModifyList* of the concerned measurement object within *VarMeasurementConfiguration*, the entry with the matching *cellIndex* value;

3> if the concerned received measurement object includes the *cellsToAddModifyList*:

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

5> if an entry is included in the parameter *cellsToAddModifyList* of the concerned measurement object within *VarMeasurementConfiguration* with the corresponding *cellIndex* value:

6> set the entry with the corresponding *cellIndex* value within the corresponding *cellsToAddModifyList* within *VarMeasurementConfiguration* to the corresponding entry of the received parameter *cellsToAddModifyList*;

5> else:

6> add the entry with the corresponding *cellIndex* value to the *VarMeasurementConfiguration* and set it to the corresponding entry of the received parameter *cellsToAddModifyList*;

3> if the concerned received measurement object includes the *blacklistedCellsToRemoveList*:

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

5> remove, from the parameter *blacklistedCellsToAddModifyList* of the concerned measurement object within *VarMeasurementConfiguration*, the entry with the matching *cellIndex* value;

3> if the concerned received measurement object includes the *blacklistedCellsToAddModifyList*:

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

5> if an entry is included in the parameter *blacklistedCellsToAddModifyList* of the concerned measurement object within *VarMeasurementConfiguration* with the corresponding *cellIndex* value:

6> set the entry with the corresponding *cellIndex* value within the corresponding *blacklistedCellsToAddModifyList* within *VarMeasurementConfiguration* to the corresponding entry of the received parameter *blacklistedCellsToAddModifyList*;

5> else:

6> add the entry with the corresponding *cellIndex* value to the *VarMeasurementConfiguration* and set it to the corresponding entry of the received parameter *blacklistedCellsToAddModifyList*;

3> for each *measId* included in the *measIdList* within *VarMeasurementConfiguration* with a matching *measObjectId* value, if any:

4> remove the entry within in *VarMeasurementReports* with a corresponding *measId* value;

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

2> else:

3> add the entry with the corresponding *measObjId* value to the *VarMeasurementConfiguration* and set it to the corresponding entry of the received parameter *measObjectToAddModifyList*;

5.5.2.6 Reporting configuration removal

The UE shall:

1> for each *reportConfigId* value included in the *reportConfigToRemoveList*:

2> remove, from the parameter *reportConfigList* within *VarMeasurementConfiguration*, the entry with the corresponding *reportConfigId* value;

2> if the removed entry included the *purpose* set to '*reportCGI*':

3> Stop timer T321, if running;

2> remove, from the parameter *measIdList* within *VarMeasurementConfiguration*, the entry(ies) with the corresponding *reportConfigId* value, if included;

2> if an entry is removed from the *measIdList* within *VarMeasurementConfiguration*:

3> remove the entry within the *VarMeasurementReports* for this *measId, if included*;

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

5.5.2.7 Reporting configuration addition/ modification

The UE shall:

1> for each *reportConfigId* value included in the *reportConfigToAddModifyList*:

2> if an entry is included in the parameter *reportConfigList* within *VarMeasurementConfiguration* with the corresponding *reportConfigId* value:

3> set the entry with the corresponding *reportConfigId* value within *VarMeasurementConfiguration* to the corresponding entry of the received parameter *reportConfigToAddModifyList*;

3> for each *measId* included in the *measIdList* within *VarMeasurementConfiguration* with a matching *reportConfigId* value, if any:

4> remove the entry within in *VarMeasurementReports* with a corresponding *measId* value;

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

2> else:

3> add the entry with the corresponding *reportConfigId* value to the *VarMeasurementConfiguration* and set it to the corresponding entry of the received parameter *reportConfigToAddModifyList*;

5.5.2.8 Quantity configuration

The UE shall:

1> if the *quantityConfig* is included within *VarMeasurementConfiguration*:

2> for each *measId* for which the UE performs measurements according to 5.5.3:

3> remove the entry within in *VarMeasurementReports* with a corresponding *measId* value;

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

3> if a *filterCoefficient* has been configured for the concerned quantity, filter the measurement information, before using the information for measurement report triggering or for measurement reporting, as follows:

4> apply the following formula:

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

The variables in the formula are defined as follows:

F_n is the updated filtered measurement result

F_{n-1} is the old filtered measurement result

M_n is the latest received measurement result from physical layer measurements, the unit used for M_n is the same unit as the reported unit in the *MeasurementReport* message or the unit used in the event evaluation.

$a = 1/2^{(k/4)}$, where k is the parameter received in the *filterCoefficent* field of the *QuantityConfig*.

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

F_0 is set to M_1 when the first measurement result from the physical layer measurement is received.

4> apply the filtering in the same domain as used for the measurement reporting, i.e. logarithmic filtering for logarithmic measurements.

NOTE 2: For further details about the physical layer measurement handling, see TS 36.133 [16].

5.5.2.9 Measurement gap configuration

The UE shall:

1> if *gapActivation* is set to '*activate*':

2> if a measurement gap configuration is active, deactivate the measurement gap configuration;

2> activate the measurement gap configuration indicated by the received *gapPattern* and 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*= TGRP/10 as defined in TS 36.133 [16];

1> else:

2> deactivate the measurement gap configuration.

5.5.3 Performing measurements

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

The UE shall:

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

2> if the measurement gap configuration is active; 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 is lower than this value:

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 measurement is configured which the UE should attempt to perform during idle periods:

2> if for one of the measurements *purpose* within the *reportConfig* is set to '*reportCGI*' and

2> if timer T321 is running:

3> determine the global cell identity of the cell included in the associated measObject by acquiring the relevant system information from the concerned cell;

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

4> acquire the additional PLMN Identities, if multiple PLMN identities are broadcast in the concerned cell;

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

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

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

4> try to acquire the RAC in the concerned cell.

5.5.4 Measurement report triggering

5.5.4.1 General

The UE shall:

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

2> if the *triggerType* is set to '*event*':

3> 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 *cellsToAddModifyList* defined within the *VarMeasurementConfiguration* 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 *VarMeasurementConfiguration* for this *measId*;

3> else if the corresponding *measObject* concerns EUTRA:

4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackListedCellsToAddModifyList* defined within the *VarMeasurementConfiguration* for this *measId*;

2> else consider a neighbouring cell on the associated frequency/ set of frequencies (GERAN) to be applicable as follows:

3> if the corresponding *reportingConfig* includes a purpose set to '*reportStrongestCellsForSON*':

4> consider any neighbouring cell detected on the associated frequency to be applicable

3> if the corresponding *reportingConfig* includes a purpose set to '*reportCGI*':

4> consider any neighbouring cell detected on the associated frequency/ set of frequencies (GERAN) which has a *physicalCellIdentity* matching the value of the *cellForWhichToReportCGI* included in the corresponding *measObject* within the *VarMeasurementConfiguration* to be applicable

3> else:

4> if the corresponding *measObject* concerns UTRA or CDMA2000:

5> consider a neighbouring cell on the associated frequency to be applicable when the concerned cell is included in the *cellsToAddModifyList* defined within the *VarMeasurementConfiguration* for this *measId* (i.e. the cell is included in the white-list);

4> else if the corresponding *measObject* concerns GERAN:

5> consider a neighbouring cell on the associated set of frequencies to be applicable when the concerned cell matches the *ncc-Permitted* defined within the *VarMeasurementConfiguration* for this *measId*;

4> else if the corresponding *measObject* concerns EUTRA:

5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackListedCellsToAddModifyList* defined within the *VarMeasurementConfiguration* 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 *VarMeasurementConfiguration*, is fulfilled for one or more applicable cells for a duration exceeding the value of *timeToTrigger* defined for this event within the *VarMeasurementConfiguration* while the *VarMeasurementReports* does not include an entry for this *measId* (a first cell triggers the event):

3> include an entry within the *VarMeasurementReports* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasurementReports* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasurementReports* for this *measId*, if not included;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *triggerType* is set to '*periodical*' and a (first) measurement result is available for one or more applicable cells:

3> include an entry within the *VarMeasurementReports* for this *measId*;

3> set the *numberOfReportsSent* defined within the V*arMeasurementReports* 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*' or to '*reportStrongestCellsForSON*', the UE initiates a first measurement report immediately after the requested *reportQuantity* becomes available for at least either serving cell or one of the applicable cells

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 *VarMeasurementConfiguration*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for a duration exceeding the value of *timeToTrigger* defined for this event within the *VarMeasurementConfiguration* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasurementReports* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasurementReports* for this *measId*, if not included;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> Upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> upon expiry of the T321 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 *VarMeasurementReports* for this

measId for a duration exceeding the value of *timeToTrigger* defined within the *VarMeasurementConfiguration* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the V*arMeasurementReports* for this *measId*;

3> if *reportOnLeave* is set for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the V*arMeasurementReports* for this *measId* is empty:

4> remove the entry within the *VarMeasurementReports* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

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 quality being better than *s-Measure* or due to the measurement gap not being active.

5.5.4.2 Event A1 (Serving becomes better than threshold)

The UE shall:

1> apply inequality A1-1, as specified below, as the entry condition for this event;

1> apply inequality A1-2, as specified below, as the leaving condition for this event;

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 cell individual offset.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Thresh is the threshold parameter for this event (i.e. *a1-Threshold* as defined within the *VarMeasurementConfiguration* 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 dBm in case ***Ms*** is expressed in dBm; otherwise it is expressed in dB.

5.5.4.3 Event A2 (Serving becomes worse than threshold)

The UE shall:

1> apply inequality A2-1, as specified below, as the entry condition for this event;

1> apply inequality A2-2, as specified below, as the leaving condition for this event;

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 cell individual offset.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Thresh is the threshold parameter for this event (i.e. *a2-Threshold* as defined within the *VarMeasurementConfiguration* 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 dBm in case ***Ms*** is expressed in dBm; otherwise it is expressed in dB.

5.5.4.4 Event A3 (Neighbour becomes offset better than serving)

The UE shall:

1> apply inequality A3-1, as specified below, as the entry condition for this event;

1> apply inequality A3-2, as specified below, as the leaving condition for this event;

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.

Ofn is the frequency specific offset of the frequency of the neighbour cell (equals *Ofs* for intra-frequency measurements and is included in *MeasObjectEUTRA* corresponding to the inter frequency as *offsetFreq* for inter-frequency measurements).

Ocn is the cell specific offset of the neighbour cell. If not configured zero offset shall be applied (included in *MeasObjectEUTRA* of the serving frequency as parameter *cellIndividualOffset* for intra-f measurements and included in *MeasObjectEUTRA* corresponding to the inter frequency as parameter *cellIndividualOffset* for inter-frequency measurements).

Ms is the measurement result of the serving cell, not taking into account any cell individual offset.

Ofs is the frequency specific offset of the serving frequency (i.e. *offsetFreq* within the *MeasObjectEUTRA* corresponding to the serving frequency).

Ocs is the cell specific offset of the serving cell (included in *MeasObjectEUTRA* of the serving frequency as parameter *cellIndividualOffset*).

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within the *VarMeasurementConfiguration* 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> apply inequality A4-1, as specified below, as the entry condition for this event;

1> apply inequality A4-2, as specified below, as the leaving condition for this event;

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.

Ofn is the frequency specific offset of the frequency of the neighbour cell.

Ocn is the cell specific offset of the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Thresh is the threshold parameter for this event (i.e. *a4-Threshold* as defined within the *VarMeasurementConfiguration* 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 dBm in case ***Ms*** is expressed in dBm; otherwise it is expressed in dB.

5.5.4.6 Event A5 (Serving becomes worse than threshold1 and neighbour becomes better than threshold2)

The UE shall:

1> apply inequality A5-1 and equation A5-2 i.e. both have to be fulfilled, as specified below, as the entry condition for this event;

1> apply inequality A5-3 and equation A5-4 i.e. at least one of the two has to be fulfilled, as specified below, as the leaving condition for this event;

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 cell individual offset.

Mn is the measurement result of the neighbouring cell.

Ofn is the frequency specific offset of the frequency of the neighbour cell.

Ocn is the cell specific offset of the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Thresh1 is the threshold parameter for this event (i.e. *a5-Threshold1* as defined within the *VarMeasurementConfiguration* for this event).

Thresh2 is the threshold parameter for this event (i.e. *a5-Threshold2* as defined within the *VarMeasurementConfiguration* 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 dBm in case ***Ms*** is expressed in dBm; otherwise it is expressed in dB.

Thresh2 is expressed in dBm in case ***Mn*** is expressed in dBm; otherwise it is expressed in dB.

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> apply inequality B1-1, as specified below, as the entry condition for this event;

1> apply inequality B1-2, as specified below, as the leaving condition for this event;

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 neighbouring inter RAT cell.

Ofn is the frequency specific offset of the frequency of the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Thresh is the threshold parameter for this event (i.e. *b1-Threshold* as defined within the *VarMeasurementConfiguration* for this event).

Mn is expressed in dBm or in dB, depending on the measurement quantity of the neighbouring inter RAT cell.

Ofn, Hys are expressed in dB.

Thresh is expressed in dBm in case ***Mn*** is expressed in dBm; otherwise it is expressed in dB.

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> apply inequality B2-1 and inequality B2-2 i.e. both have to be fulfilled, as specified below, as the entry condition for this event;

1> apply inequality B3-3 and inequality B2-4 i.e. at least one of the two has to be fulfilled, as specified below, as the leaving condition for this event;

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 cell individual offset.

Mn is the measurement result of the neighbouring inter RAT cell.

Ofn is the frequency specific offset of the frequency of the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within the *VarMeasurementConfiguration* for this event).

Thresh1 is the threshold parameter for this event (i.e. b2-*Threshold1* as defined within the *VarMeasurementConfiguration* for this event).

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2* as defined within the *VarMeasurementConfiguration* 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 neighbouring inter RAT cell.

Ofn, Hys are expressed in dB.

Thresh1 is expressed in dBm in case ***Ms*** is expressed in dBm; otherwise it is expressed in dB.

Thresh2 is expressed in dBm in case ***Mn*** is expressed in dBm; otherwise it is expressed in dB.

5.5.5 Measurement reporting

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measuredResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *neighbouringMeasResults* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

2> if the *triggerType* is set to '*event*':

3> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasurementReports* for this *measId*;

2> else:

3> set the *neighbouringMeasResults* to include the applicable cells for which the requested *reportQuantity* has been available since the last periodical reporting or since the measurement was initiated or reset;

2> for each cell that is included in the *neighbouringMeasResults*, include the *physicalCellIdentity*;

2> if the *triggerType* is set to '*event*'; or the *purpose* is set to '*reportStrongestCells*' or to '*reportStrongestCellsForSON*', ordered as follows:

3> for each included cell include the filtered measured results in accordance with the *reportConfigList* defined in variable *VarMeasurementConfiguration* for that *measId* as follows:

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

5> if the *reportQuantity* within the concerned *reportConfig* is set to '*both*' (E-UTRA):

6> set the *measResult* to include both quantities (i.e. *rscpResult* and *rsrqResult*) in order of decreasing *triggerQuantity*, i.e. the best cell is included first;

5> else:

6> set the *measResult* to include the quantity as indicated by the *triggerQuantity* within the concerned *reportConfig* in order of decreasing *triggerQuantity*, i.e. the best cell is included first;

4> else:

5> 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;

2> else if the *purpose* is set to '*reportCGI*':

3> include the *globalCellIdentity* of the requested neighbouring cell;

1> increment the *numberOfReportsSent* as defined within the V*arMeasurementReports* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the V*arMeasurementReports* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportingConfiguration* as defined in the *VarMeasurementConfiguration*:

2> stop the periodical reporting timer, if running;

2> start the periodical reporting timer with the value of *reportInterval* as defined within the *VarMeasurementConfiguration* for this *measId*;

1> else if the *numberOfReportsSent* as defined within the V*arMeasurementReports* for this *measId* is equal to the *reportAmount* as defined within the corresponding *reportingConfiguration* as defined in the *VarMeasurementConfiguration*:

2> if the *triggerType* is set to '*periodical*':

3> remove the entry within the *VarMeasurementReports* for this *measId*;

1> if the measured results are for CDMA HRPD:

2> set the *hrpdPreRegistrationStatus* to the UE's CDMA upper layer's HRPD *preRegistrationStatus*;

1> if the measured results are for CDMA 1xRTT:

2> set the hrpd*PreRegistrationStatus* to `0';

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 *measObjId* corresponding to the handover target carrier frequency is configured as a result of the procedures described in this subclause and in 5.3.5.4;
- when performing the connection re-establishment procedure, as specified in 5.3.7, ensure that a *measObjId* corresponding to the target carrier frequency is configured as a result of the procedure described in this subclause and the subsequent connection reconfiguration procedure immediately following the re-establishment procedure;

The UE shall:

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 *VarMeasurementConfiguration* as follows:

2> if a *measObjId* value corresponding to the target carrier frequency exists in the *measObjectList* within *VarMeasurementConfiguration*:

3> for each *measId* value in the *measIdList*:

4> if the *measId* value is linked to the *measObjId* value corresponding to the source carrier frequency:

5> link this *measId* value to the *measObjId* value corresponding to the target carrier frequency;

4> else if the *measId* value is linked to the *measObjId* value corresponding to the target carrier frequency:

5> link this *measId* value to the *measObjId* value corresponding to the source carrier frequency;

2> else:

3> remove all *measId* values that are linked to the *measObjId* value corresponding to the source carrier frequency;

1> remove all measurement reporting entries within *VarMeasurementReports*;

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> deactivate 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 activated 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 *speedDependentParameters* within *VarMeasurementConfiguration*;

1> if high mobility state is detected:

2> multiply *timeToTrigger* by *timeToTriggerSF-High* within *VarMeasurementConfiguration*;

1> else if medium mobility state is detected:

2> multiply *timeToTrigger* by *timeToTriggerSF-Medium* within *VarMeasurementConfiguration*;

1> else

2> no scaling is applied.

5.6 Other

5.6.1 DL information transfer

5.6.1.1 General

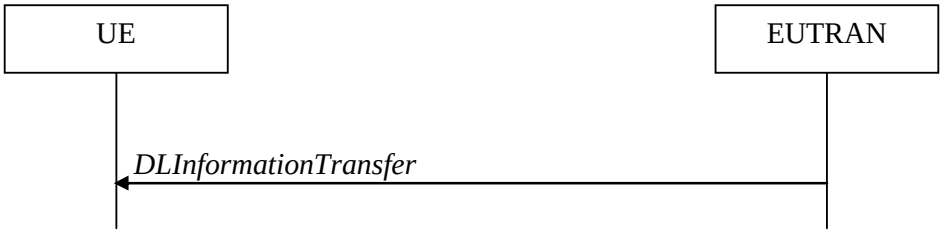

Figure 5.6.1.1-1: DL information transfer

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 *informationType* is set to '*nas3GPP*':

2> Forward the *NAS-DedicatedInformation* to the NAS upper layers.

1> If the *informationType* is set to '*cdma2000*'::

2> Forward the *cdma2000-Type* and the *cdma2000-DedicatedInfo* to the CDMA upper layers.

5.6.2 UL information transfer

5.6.2.1 General

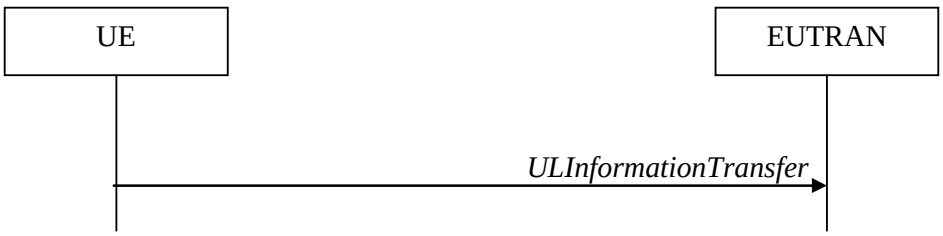

Figure 5.6.2.1-1: UL information transfer

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. 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 *informationType* to '*nas3GPP*'.

2> include the *NAS-DedicatedInformation*.

1> if there is a need to transfer CDMA2000 information:

2> set the *informationType* to '*cdma2000*';

2> include the *cdma2000-Type* and the *cdma2000-DedicatedInfo*;

5.6.2.4 Failure to deliver *ULInformationTransfer* message

The UE shall:

1> if mobility (i.e. handover, RRC connection re-establishment) occurs before the successful delivery of *ULInformationTransfer* messages has been confirmed by lower layers:

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

5.6.3 UE capability transfer

5.6.3.1 General

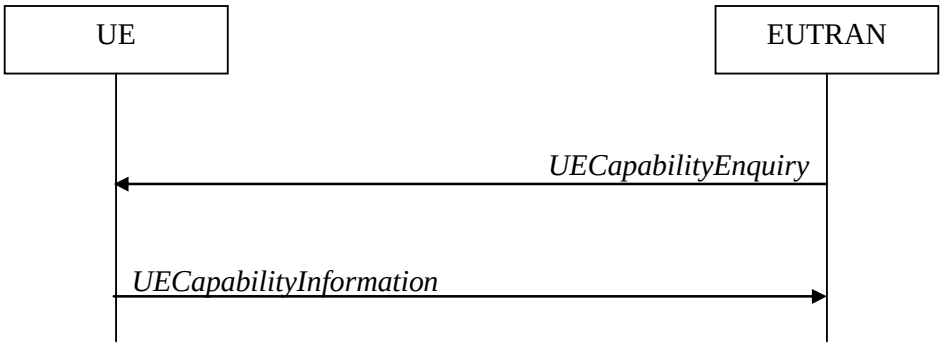

Figure 5.6.3.1-1: UE capability transfer

The purpose of this procedure is to transfer UE radio access capability information from the UE to E-UTRAN.

If the UE has changed its E-UTRAN radio access capabilities, the UE shall request higher layers to initiate the necessary NAS procedures (see TS 23.401) that would result in the update of UE radio access capabilities using a new RRC Connection.

NOTE: Change of the UE's GERAN and/ or UTRAN UE radio capabilities in RRC_IDLE state 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-RadioAccessCapRequest* includes E-UTRA:

3> include the *UE-EUTRA-Capability* within a *ueCapabilitiesRAT-Container* and with the *rat-Type* set to '*eutra*';

2> If the *ue-RadioAccessCapRequest* includes *GERAN* and if the UE supports GERAN:

3> include the UE radio access capabilities for GERAN within a *ueCapabilitiesRAT-Container* and with the *rat-Type* set to '*geran*';

2> If the *ue-RadioAccessCapRequest* includes *UTRA* and if the UE supports UTRA:

3> include the UE radio access capabilities for UTRA within a *ueCapabilitiesRAT-Container* and with the *rat-Type* set to '*utran*';

2> If the *ue-RadioAccessCapRequest* includes *CDMA2000-1xRTT Bandclass* and if the UE supports CDMA2000-1xRTT:

3> include the UE band class radio access capabilities for CDMA 2000 within a *ueCapabilitiesRAT-Container* and with the *rat-Type* set to '*cdma2000-1xrttBandClass*';

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

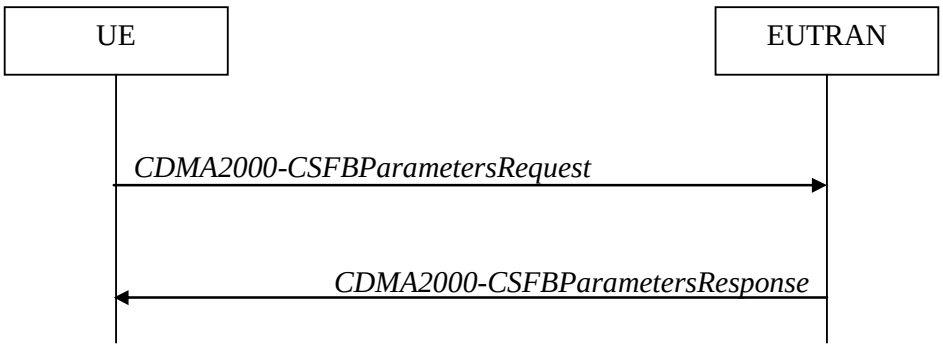

Figure 5.6.4.1-1: CSFB to 1x Parameter transfer

The purpose of this procedure is to transfer the CDMA2000 1xRTT parameters required to register the UE in the 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 CDMA upper layers. The UE initiates the CSFB to 1x Parameter transfer procedure by sending the *CDMA2000-CSFBParametersRequest* message.

5.6.4.3 Actions related to transmission of *CDMA2000-CSFBParametersRequest* message

The UE shall:

1> submit the *CDMA2000-CSFBParametersRequest* message to lower layers for transmission using the current configuration.

5.6.4.4 Reception of the *CDMA2000-CSFBParametersResponse* message

Upon reception of the *CDMA2000-CSFBParametersResponse* message, the UE shall:

1> forward the *cdma2000-RAND* and the *cdma2000-OneXRTTMobilityParameters* to the CDMA 1xRTT upper layers.

5.7 Generic error handling

5.7.1 General

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.

5.7.3 Not supported protocol extension

The UE shall, when receiving an RRC message on the BCCH, PCCH or CCCH:

1> if the UE does not comprehend the message type or version:

2> ignore the message;

The UE shall, when receiving an RRC message on any logical channel:

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 has a value that the UE does not comprehend:

2> if a default value is defined for this field:

3> treat the rest of the message while using the default value defined for this field;

2> else:

3> ignore the message;

1> if the message includes a field that is optional to include in the message (e.g. because conditions for optional presence are fulfilled) and that has a value that the UE does not comprehend:

2> treat the rest of the message as if the field was absent;

1> if the message includes a protocol extension that the UE does not comprehend:

2> treat the rest of the message as if the extension was absent.

NOTE This section does not apply for the case the received message includes an field that is set to a spare value while the specification defines the UE behaviour for the case the field is set to a spare value, i.e. this section only concerns protocol extensions for which no UE behaviour has been specified.

5.7.4 Other errors

The UE shall, when receiving an RRC message on the BCCH, PCCH or CCCH:

1> if the message includes a field that is mandatory to include because conditions for mandatory presence are fulfilled) and that field is absent:

2> ignore the message.

6 Protocol data units, formats and parameters (tabular & ASN.1)

6.1 General

The contents of each RRC message is specified in subclause 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 subclause 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.
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 OD (Used in downlink only)	*Optionally present, Discontinue* 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 OD.

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 {
        cdma2000-CSFBParametersResponse         CDMA2000-CSFBParametersResponse,
        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 {
        cdma2000-CSFBParametersRequest          CDMA2000-CSFBParametersRequest,
        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

– *CDMA2000-CSFBParametersRequest*

The *CDMA2000-CSFBParametersRequest* message is used by the UE to obtain the CDMA2000 1x Parameters from the network. The UE needs these parameters to generate the 1xRTT Registration message used to register with the CDMA2000 1xRTT Network which is required to support CSFB to 1xRTT.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

***CDMA2000-CSFBParametersRequest* message**

```
-- ASN1START

CDMA2000-CSFBParametersRequest ::= SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        cdma2000-CSFBParametersRequest-r8   CDMA2000-CSFBParametersRequest-r8-IEs,
        criticalExtensionsFuture            SEQUENCE {}
    }
}

CDMA2000-CSFBParametersRequest-r8-IEs ::= SEQUENCE {
    nonCriticalExtension                SEQUENCE {}                     OPTIONAL
}
-- ASN1STOP
```

***CDMA2000-CSFBParametersRequest* field descriptions**
%fieldIdentifier%

– *CDMA2000-CSFBParametersResponse*

The *CDMA2000- CSFBParametersResponse* message is used to provide the CDMA2000 1x Parameters to the UE so the UE can register with the CDMA2000 1xRTT Network to support CSFB to 1xRTT.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

***CDMA2000- CSFBParametersResponse* message**

```
-- ASN1START

CDMA2000-CSFBParametersResponse ::= SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                      CHOICE {
        cdma2000-1xParametersForCSFB-r8         CDMA2000-CSFBParametersResponse-r8-IEs,
        criticalExtensionsFuture                SEQUENCE {}
    }
}

CDMA2000-CSFBParametersResponse-r8-IEs ::= SEQUENCE {
    cdma2000-RAND                           CDMA2000-RAND,
    cdma2000-MobilityParameters             CDMA2000-MobilityParameters,
    nonCriticalExtension                SEQUENCE {}                     OPTIONAL    --Need OP
}

-- ASN1STOP
```

***CDMA2000-CSFBParametersResponse* field descriptions**
Void

– *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
}

DRB-CountMSB-InfoList::=        SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE {
    drb-Identity                    INTEGER(1..32),
    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 SEQUENCE {
    drb-Identity                    INTEGER(1..32),
    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.

– *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)

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

NOTE If SRB2 is suspended, E-UTRAN does not send this message until SRB2 is resumed.

***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 {
    informationType                     CHOICE {
        nas3GPP                             NAS-DedicatedInformation,
        cdma2000                            SEQUENCE {
            cdma2000-Type                       CDMA2000-Type,
            cdma2000-DedicatedInfo              CDMA2000-DedicatedInfo
        }
    },
    nonCriticalExtension                SEQUENCE {}                     OPTIONAL    --Need OP
}

-- ASN1STOP
```

***DLInformationTransfer* field descriptions**
nas3GPP This field is used to transfer dedicated information for 3GPP NAS. The RRC layer is transparent for this information.

– *HandoverFromEUTRAPreparationRequest* (CDMA2000)

The *HandoverFromEUTRAPreparationRequest* message is used to trigger the handover preparation procedure with a CDMA2000 RAT.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

***HandoverFromEUTRAPreparationRequest* message**

```
-- ASN1START

HandoverFromEUTRAPreparationRequest ::= SEQUENCE {
    rrc-TransactionIdentifier       RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE {
            handoverFromEUTRAPreparationRequest-r8
                                                HandoverFromEUTRAPreparationRequest-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

HandoverFromEUTRAPreparationRequest-r8-IEs ::= SEQUENCE {
    cdma2000-Type                       CDMA2000-Type,
    cdma2000-RAND                       CDMA2000-RAND               OPTIONAL,  -- Cond cdma2000-Type
    cdma2000-MobilityParameters         CDMA2000-MobilityParameters OPTIONAL,  -- Cond cdma2000-Type
    nonCriticalExtension                SEQUENCE {}                 OPTIONAL    -- Need OP
}

-- ASN1STOP
```

***HandoverFromEUTRAPreparationRequest* field descriptions**
Void

Conditional presence	Explanation
cdma2000-Type	The field is mandatory present if the cdma2000-Type = type1XRTT; otherwise it is not applicable.

– *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, spare2, spare1},
    phich-Configuration                 PHICH-Configuration,
    systemFrameNumber                   BIT STRING (SIZE (8)),
    spare                               BIT STRING (SIZE (10))
}


-- ASN1STOP
```

***MasterInformationBlock* field descriptions**
dl-Bandwidth The transmission bandwidth configuration (NRB). n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on
systemFrameNumber Defines the 8 most significant bits of the SFN. 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).

Editor's note: The behaviour of Rel-8 UE when one of the two spare values is received for *dl-Bandwidth* is FFS.

– *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 {
    measuredResults                     MeasuredResults,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

***MeasurementReport* field descriptions**
measuredResults The m*easuredResults* covers measured results for intra-frequency, inter-frequency and inter- RAT mobility.

– *MobilityFromEUTRACommand*

The *MobilityFromEUTRACommand* message is used to command handover or a cell change from E-UTRA to another RAT (3GPP or non-3GPP).

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

MobilityFromEUTRACommand message

```
-- ASN1START
```

```
MobilityFromEUTRACommand ::=        SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            mobilityFromEUTRACommand-r8         MobilityFromEUTRACommand-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

MobilityFromEUTRACommand-r8-IEs ::= SEQUENCE {
    csFallbackIndicator                 ENUMERATED {true}                   OPTIONAL,   -- Need ON
    purpose                             CHOICE{
        handover                            Handover,
        cellChangeOrder                     CellChangeOrder
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

Handover ::=                            SEQUENCE {
    targetRAT-Type                      ENUMERATED {
                                            utran, geran, cdma2000-1XRTT, cdma2000-HRPD,
                                            spare4, spare3, spare2, spare1, ...},
    targetRAT-MessageContainer          OCTET STRING,
    nas-SecurityParamFromEUTRA          OCTET STRING
}

CellChangeOrder ::=                 SEQUENCE {
    t304                                ENUMERATED {
                                            ms100, ms200, ms500, ms1000,
                                            ms2000, ms4000, ms8000, spare},
    targetRAT-Type                      CHOICE {
            geran                           SEQUENCE {
                bsic                            GERAN-CellIdentity,
                geran-CarrierFreq               GERAN-CarrierFreq,
                networkControlOrder             BIT STRING (SIZE (2))       OPTIONAL,   -- Need OP
                geran-SystemInformation         CHOICE {
                    si                              GERAN-SystemInformation,
                    psi                             GERAN-SystemInformation
                }                                                           OPTIONAL    -- Need OP
            },
            ...
    }
}

GERAN-SystemInformation ::=         SEQUENCE (SIZE (1..maxGERAN-SI)) OF
                                        OCTET STRING (SIZE (1..23))

-- ASN1STOP
```

***MobilityFromEUTRACommand* field descriptions**
t304 Timer T304 as described in section 7.3. Value ms100 corresponds with 100 ms, ms200 corresponds with 200 ms and so on.
csFallbackIndicator Indicates that the CS Fallback procedure is triggered.
targetRAT-Type Indicates the target RAT type.
targetRAT-MessageContainer Used to carry messages corresponding to specifications from the target RAT.
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.

bsic
contains the network colour code and the base station colour code of the target GERAN cell.
geran-CarrierFreq
contains the carrier frequency of the target GERAN cell
networkControlOrder
Parameter NETWORK_CONTROL_ORDER in TS 44.060 [36].
geran-SystemInformation
As specified in TS 44.060 [36]. The first octet contains octet 1 of the GERAN system information block, the second octet contains octet 2 of the GERAN system information block and so on. If the field is not present, the UE has to acquire this from the GERAN cell.

– *Paging*

The *Paging* message is used for the notification of one or more UEs.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: PCCH

Direction: E-UTRAN to UE

***Paging* message**

```
-- ASN1START

Paging ::=                  SEQUENCE {
    pagingRecordList                PagingRecordList                    OPTIONAL,   -- Need ON
    systemInfoModification          ENUMERATED {true}                   OPTIONAL,   -- Need ON
    etws-Indication                 ENUMERATED {true}                   OPTIONAL,   -- Need ON
    nonCriticalExtension            SEQUENCE {}                         OPTIONAL    -- Need OP
}

PagingRecordList ::=            SEQUENCE (SIZE (1..maxPageRec)) OF PagingRecord

PagingRecord ::=                SEQUENCE {
        ue-Identity                 PagingUE-Identity,
        cn-Domain                   ENUMERATED  {ps, cs},
        ...
    }

PagingUE-Identity ::=           CHOICE {
    s-TMSI                          S-TMSI,
    imsi                            IMSI,
    ...
}

-- ASN1STOP
```

***Paging* field descriptions**
cn-Domain Indicates the origin of paging.
pagingUE-Identity Provides the NAS identity of the UE that is being paged.
systemInfoModification If present: indication of a BCCH modification other than SIB10 and SIB11.
etws-Indication If present: indication of an ETWS primary notification and/ or ETWS secondary notification.
s-TMSI The temporary UE identity provided by the MME which uniquely identifies the UE within the tracking area, see TS 23.003 [27].
imsi The globally unique permanent subscriber identity, see TS 23.003 [27].

– *RRCConnectionReconfiguration*

The *RRCConnectionReconfiguration* message is the command to modify an RRC connection. It may convey information for measurement configuration, mobility control, dedicated NAS information, radio resource configuration (including RBs, MAC main configuration and physical channel configuration), security configuration and UE related information.

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 {
    measurementConfiguration            MeasurementConfiguration        OPTIONAL,   -- Need ON
    mobilityControlInformation          MobilityControlInformation      OPTIONAL,   -- Need OP
    nas-DedicatedInformationList        SEQUENCE (SIZE(1..maxDRB)) OF
                                            NAS-DedicatedInformation    OPTIONAL,   -- Cond nonHO
    radioResourceConfiguration          RadioResourceConfigDedicated    OPTIONAL,   -- Need ON
    securityConfiguration               SecurityConfiguration           OPTIONAL,   -- Cond HO
    nas-SecurityParamToEUTRA            OCTET STRING (SIZE(6))          OPTIONAL,   -- Cond I-RATHO
    nonCriticalExtension                SEQUENCE {}                     OPTIONAL    -- Need OP
}

-- ASN1STOP
```

***RRCConnectionReconfiguration* field descriptions**
measurementConfiguration This field 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.
mobilityControlInformation This field includes parameters relevant for network controlled mobility to/within E-UTRA.
nas-DedicatedInformationList 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.
radioResourceConfiguration This field is used to setup/modify/release RBs, to setup/modifiy transport channel configurations and to setup/modify physical channels.
securityConfiguration This field is used to configure AS integrity protection (CP) and AS ciphering (CP and UP) and to provide the next hop Chaining Count.
nas-securityParamToEUTRA This field is used to activate NAS security after inter-RAT handover to E-UTRA. The content is defined in TS 24.301.

Conditional presence	Explanation
HO	The field is mandatory present if the IE *MobilityControlInformation* is present in the *RRCConnectionReconfiguration* message; otherwise the field is not applicable.
I-RATHO	The field is mandatory present in case of inter-RAT handover to E-UTRA; otherwise it is not applicable.
nonHO	The field is not applicable in case of handover within E-UTRA or to E-UTRA; otherwise it is optional present, continue.

– *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
```

***RRCConnectionReconfigurationComplete* field descriptions**
%fieldIdentifier%

Editor's note: (Temporary note, just for information, i.e. nothing to be captured) Also when this message is used to confirm a successful handover, the same transfer mechanism applies, i.e. SRB1, RLC AM, DCCH. Contention is handled at the MAC (control element including C-RNTI), while PDCP includes regular MAC-I. If segmentation is needed, the eNB may provide an additional allocation, e.g. in the sub-frame following Msg3 transmission.

– *RRCConnectionReestablishment*

The *RRCConnectionReestablishment* message is used to resolve contention and to establish SRBs.

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 {
    radioResourceConfiguration          RadioResourceConfigDedicated,
    nextHopChainingCount                NextHopChainingCount,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- ASN1STOP
```

***RRCConnectionReestablishment* field descriptions**
radioResourceConfiguration Only SRB1 configuration information is applicable (modification, i.e., delta signalling)
nextHopChainingCount Parameter NCC: See TS 33.401 [32]

Editor's note: For this message specific HARQ operation applies, i.e., only UEs for which the Initial UE identity matches provide a HARQ acknowledgment.

– *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
```

***RRCConnectionReestablishmentComplete* field descriptions**
%fieldIdentifier%

– *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
```

***RRCConnectionReestablishmentReject* field descriptions**
%fieldIdentifier%

– *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,
    physCellIdentity                    PhysicalCellIdentity,
    shortMAC-I                          ShortMAC-I
}

ReestablishmentCause ::=            ENUMERATED {
                                        reconfigurationFailure, handoverFailure,
                                        otherFailure, spare}

-- 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.
physCellIdentity 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.

Editor's note: For this message specific HARQ operation applies, i.e. only UEs for which the Initial UE identity matches provide a HARQ acknowledgment.

– *RRCConnectionRelease*

The *RRCConnectionRelease* message is used to command the release of an RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

RRCConnectionRelease message

```
-- ASN1START

RRCConnectionRelease ::=            SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE {
            rrcConnectionRelease-r8             RRCConnectionRelease-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

RRCConnectionRelease-r8-IEs ::=     SEQUENCE {
    releaseCause                        ReleaseCause,
    redirectionInformation              RedirectionInformation              OPTIONAL,   -- Need ON
    idleModeMobilityControlInfo         IdleModeMobilityControlInfo         OPTIONAL,   -- Need OP
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

ReleaseCause ::=                ENUMERATED {loadBalancingTAUrequired,
                                            other,spare2, spare1 }

RedirectionInformation ::=          CHOICE {
    eutra-CarrierFreq                   EUTRA-DL-CarrierFreq,
    interRAT-target                     CHOICE {
        geran                               GERAN-CarrierFreq,
        utra-FDD                            UTRA-DL-CarrierFreq,
        utra-TDD                            UTRA-DL-CarrierFreq,
        cdma2000-HRPD                       CDMA2000-CarrierInfo,
        cdma2000-1xRTT                      CDMA2000-CarrierInfo,
        ...
    }
}

IdleModeMobilityControlInfo ::=     SEQUENCE {
    interFreqPriorityList               InterFreqPriorityList           OPTIONAL,       -- Need ON
```

```
    geran-FreqPriorityList              GERAN-FreqPriorityList          OPTIONAL,       -- Need ON
    utra-FDD-FreqPriorityList           UTRA-FDD-FreqPriorityList       OPTIONAL,       -- Need ON
    utra-TDD-FreqPriorityList           UTRA-TDD-FreqPriorityList       OPTIONAL,       -- Need ON
    hrpd-BandClassPriorityList          HRPD-BandClassPriorityList          OPTIONAL,   -- Need ON
    oneXRTT-BandClassPriorityList       OneXRTT-BandClassPriorityList       OPTIONAL,   -- Need ON
    t320                                ENUMERATED {
                                            min5, min10, min20, min30, min60, min120, min180,
                                            spare}                          OPTIONAL,   -- Need OD
    ...
}

InterFreqPriorityList ::=           SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {
    eutra-CarrierFreq                   EUTRA-DL-CarrierFreq,
    cellReselectionPriority             INTEGER (0..7)
}

GERAN-FreqPriorityList ::=          SEQUENCE (SIZE (1..maxGNFG)) OF SEQUENCE {
    geran-BCCH-FrequencyGroup           GERAN-CarrierFreqList,
    geran-CellReselectionPriority       INTEGER (0..7)
}

UTRA-FDD-FreqPriorityList ::=       SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF SEQUENCE {
    utra-CarrierFreq                    UTRA-DL-CarrierFreq,
    utra-CellReselectionPriority        INTEGER (0..7)
}

UTRA-TDD-FreqPriorityList ::=       SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF SEQUENCE {
    utra-CarrierFreq                    UTRA-DL-CarrierFreq,
    utra-CellReselectionPriority        INTEGER (0..7)
}

HRPD-BandClassPriorityList ::=      SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF SEQUENCE {
    hrpd-bandClass                      CDMA2000-Bandclass,
    hrpd-CellReselectionPriority        INTEGER (0..7)
}

OneXRTT-BandClassPriorityList ::=   SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF SEQUENCE {
    oneXRTT-bandClass                   CDMA2000-Bandclass,
    oneXRTT-CellReselectionPriority     INTEGER (0..7)
}
-- ASN1STOP
```

***RRCConnectionRelease* field descriptions**
releaseCause   *The releaseCause is used to indicate the reason for releasing the RRC Connection.*
redirectionInformation   The r*edirectionInformation* 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].
GERAN-CarrierFreq   Indicates frequency and band indicator of the cell.
UTRA-DL-CarrierFreq   Indicates frequency of the cell.
CDMA2000-CarrierInfo   Indicates frequency and band class of the cell.
x-CarrierFreq or x-BandClass   The carrier frequency (UTRAN and E-UTRAN) and band class (HRPD and 1xRTT) for which the associated cellReselectionPriority is applied.
cellReselectionPriority   Absolute priority of the associated carrier frequency (0 means: lowest priority).
t320   Timer T320 as described in section 7.3. Value minN corresponds to N minutes.
geran-BCCH-FrequencyGroup   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.
s-TMSI   The temporary UE identity provided by the MME which uniquely identifies the UE within the tracking area, see TS 23.003 [27].
randomValue   Integer value in the range 0 to 2**40 – 1.

Editor's note: It has been concluded that there is no need to transfer UE capability info early (i.e. redirection may be performed after the UE context is transferred across S1)

– *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 {
    radioResourceConfiguration          RadioResourceConfigDedicated,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- ASN1STOP
```

***RRCConnectionSetup* field descriptions**
radioResourceConfiguration
Only SRB1 configuration information is applicable

Editor's note: For this message specific HARQ operation applies, i.e. only UEs for which the Initial UE identity matches provide a HARQ acknowledgment.

– *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,
    nas-DedicatedInformation            NAS-DedicatedInformation,
    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-IdentyList 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 The GUMMEI of the MME where the UE is registered.
nas-DedicatedInformation This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this information.
mmegi Provides the Group Identity of the registered MME within the PLMN.

– *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,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

SecurityModeCommand-r8-IEs ::=      SEQUENCE {
    securityConfiguration               SecurityConfiguration,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- ASN1STOP
```

***SecurityModeCommand* field descriptions**
securityConfiguration This field is used to configure AS integrity protection (CP) and AS ciphering (CP and UP).

– *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
```

***SecurityModeComplete* field descriptions**
%fieldIdentifier%

– *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 {
    -- Enter the IEs here.                                                  FFS
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

***SecurityModeFailure* field descriptions**
%fieldIdentifier%

– *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 {      -- Size is FFS
        sib2                            SystemInformationBlockType2,
        sib3                            SystemInformationBlockType3,
        sib4                            SystemInformationBlockType4,
        sib5                            SystemInformationBlockType5,
        sib6                            SystemInformationBlockType6,
        sib7                            SystemInformationBlockType7,
        sib8                            SystemInformationBlockType8,
        sib9                            SystemInformationBlockType9,
        sib10                           SystemInformationBlockType10,
        sib11                           SystemInformationBlockType11,
        ...
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

-- ASN1STOP
```

***SystemInformation* field descriptions**

– *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

Editor's note RAN1 has agreed (R2-080475) that DL RX Tx power should be indicated on BCCH mapped to DL-SCH. FFS in which SIB and SI this should be provided

SystemInformationBlockType1 message

```
-- ASN1START

SystemInformationBlockType1 ::=     SEQUENCE {
    cellAccessRelatedInformation        SEQUENCE {
        plmn-IdentityList                   PLMN-IdentityList,
        trackingAreaCode                    TrackingAreaCode,
```

```
        cellIdentity                        CellIdentity,
        cellBarred                          ENUMERATED {barred, notBarred},
        intraFrequencyReselection           ENUMERATED {allowed, notAllowed},
        csg-Indication                      BOOLEAN,
        csg-Identity                        BIT STRING (SIZE (27))  OPTIONAL
    },
    cellSelectionInfo                   SEQUENCE {
        q-RxLevMin                          INTEGER (-70..-22),
        q-RxLevMinOffset                    INTEGER (1..8)          OPTIONAL    -- Need OP
    },                                                                              -- need FFS
    p-Max                               P-Max                       OPTIONAL,    -- need OP
    frequencyBandIndicator              INTEGER (1..64),
    schedulingInformation               SchedulingInformation,
    tdd-Configuration                   TDD-Configuration           OPTIONAL,   -- Cond TDD
    si-WindowLength                     ENUMERATED {
                                            ms1, ms2, ms5, ms10, ms15, ms20,
                                            ms40, spare1},
    systemInformationValueTag           INTEGER (0..31),
    nonCriticalExtension                SEQUENCE {}                 OPTIONAL    -- Need OP
}

PLMN-IdentityList ::=                   SEQUENCE (SIZE (1..6)) OF SEQUENCE {
    plmn-Identity                           PLMN-Identity,
    cellReservedForOperatorUse              ENUMERATED {reserved, notReserved}
}

SchedulingInformation  ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {
    si-Periodicity                      ENUMERATED {
                                            rf8, rf16, rf32, rf64, rf128, rf256, rf512,
                                            spare1, ...},
    sib-MappingInfo                     SIB-MappingInfo
}

SIB-MappingInfo  ::= SEQUENCE (SIZE (0..maxSIB-1)) OF SIB-Type

-- ASN1STOP
```

***SystemInformationBlockType1* field descriptions**
cellReservedForOperatorUse As defined in TS 36.304 [4]
trackingAreaCode Common TAC for all the PLMNs listed
cellBarred 'Barred' means barred for all calls, as defined in TS 36.304 [4]
intraFrequencyReselection Used to control cell reselection on intra-frequency cells when the highest ranked cell is barred, or is considered 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 'white list' that the UE has stored.
q-RxLevMin Parameter $Q_{rxlevmin}$ in 36.304 [4]. Actual value $Q_{rxlevmin}$ = IE value * 2 [dBm]. Specifies the minimum required Rx RSRP level in the cell.
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 Parameter: Pmax to be used in the cell. If absent the UE applies the maximum power according to the UE capability.
frequencyBandIndicator Defined in [36.101].
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. If value *spare1* is received, it is interpreted as *rf512*.
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 *schedulingInformation* 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. If value *spare1* is received, it is interpreted as *ms40*.
systemInformationValueTag 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, otherwise the IE is absent

Conditional presence	Explanation
TDD	This field is mandatory present for TDD; it is not present for FDD.

– *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-RadioAccessCapRequest            UE-RadioAccessCapRequest,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

UE-RadioAccessCapRequest ::=        SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT-Type

-- ASN1STOP
```

***UECapabilityEnquiry* field descriptions**
ue-RadioAccesCapabilityReq
List of the RATs for which the UE is requested to transfer the UE radio access capabilities i.e. E UTRA and/ or other RATs, e.g., UTRA, GERAN or 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 (SIZE (1..maxRAT-Capabilities)) OF SEQUENCE {
    rat-Type                            RAT-Type,
    ueCapabilitiesRAT-Container         OCTET STRING,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

***UECapabilityInformation* field descriptions**
ueCapabilitesRAT-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 encoding of UE capabilities is defined in IE [FFS] TS 25.331 [19]. For GERAN: the encoding of UE capabilities is defined in IE [FFS] [24.008 and/ or 44.018; FFS]. For CDMA2000-1xRTT Bandclass: the encoding of UE capabilities is defined in IE [A.S.0008; FFS]

Editor's note: The structure of the CDMA2000-1xRTT Bandclass is specified in A.S.0008 but the information to be included will be captured in FFS PP2 spec.

– *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,
    cdma2000-MEID                       BIT STRING (SIZE (56))  OPTIONAL,
    cdma2000-DedicatedInfo              CDMA2000-DedicatedInfo,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

ULHandoverPreparationTransfer field descriptions
cdma2000-MEID
The 56 bit mobile identification number provided by the CDMA 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)

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

NOTE If SRB2 is suspended, the UE does not send this message until SRB2 is resumed.

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 {
```

```
    informationType                     CHOICE {
        nas3GPP                             NAS-DedicatedInformation,
        cdma2000                            SEQUENCE {
            cdma2000-Type                       CDMA2000-Type,
            cdma2000-DedicatedInfo              CDMA2000-DedicatedInfo
        }
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

***ULInformationTransfer* field descriptions**
nas3GPP
This field is used to transfer dedicated information for 3GPP NAS. The RRC layer is transparent for this information.

6.3 RRC information elements

6.3.1 System information blocks

– SIB-Type

The IE *SIB-Type* is used for SIB mapping

***SIB-Type* information element**

```
-- ASN1START

SIB-Type ::=                            ENUMERATED {
                                            sibType3, sibType4, sibType5, sibType6,
                                            sibType7, sibType8, sibType9, sibType10,
                                            sibType11, spare7, spare6, spare5,
                                            spare4, spare3, spare2, spare1, ...}

-- ASN1STOP
```

***SIB-Type* field descriptions**
Void

– *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 {
    accessBarringInformation            SEQUENCE {
        accessBarringForEmergencyCalls      BOOLEAN,
        accessBarringForSignalling          AccessClassBarringInformation   OPTIONAL,   -- Need OP
        accessBarringForOriginatingCalls    AccessClassBarringInformation   OPTIONAL    -- Need OP
    }       OPTIONAL,                                                                   -- Need OP
    radioResourceConfigCommon           RadioResourceConfigCommonSIB,
    ue-TimersAndConstants               UE-TimersAndConstants,
    frequencyInformation                SEQUENCE {
        ul-EARFCN                           INTEGER (0..maxEARFCN)          OPTIONAL,   -- Need OP
        ul-Bandwidth                        ENUMERATED {
```

```
                                            n6, n15, n25, n50, n75, n100, spare2,
                                            spare1}                     OPTIONAL,   -- Need OP
        additionalSpectrumEmission          INTEGER (0..31)
    },
    mbsfn-SubframeConfiguration         MBSFN-SubframeConfiguration         OPTIONAL,   -- Need OD
    timeAlignmentTimerCommon            TimeAlignmentTimer,
    ...
}

AccessClassBarringInformation ::=   SEQUENCE {
    accessProbabilityFactor             ENUMERATED {
                                            p00, p05, p10, p15, p20, p25, p30, p40,
                                            p50, p60, p70, p75, p80, p85, p90, p95},
    accessBarringTime                   ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512},
    accessClassBarringList              AccessClassBarringList
}

AccessClassBarringList ::=          SEQUENCE (SIZE (maxAC)) OF SEQUENCE {
    accessClassBarring                  BOOLEAN
}

MBSFN-SubframeConfiguration ::=     SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF 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**
accessBarringForEmergencyCalls Access class barring for AC 10.
accessBarringForSignalling Access class barring for mobile originating signalling
accessBarringForOriginatingCalls Access class barring for mobile originating calls
accessProbabilityFactor 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.
accessBarringTime Mean access barring time in seconds.
accessClassBarringList Access class barring for AC 11-15. First in the list is for AC 11, second in the list is for AC 12, and so on
ul-EARFCN For FDD: Default value determined from default TX-RX frequency separation defined in [36.101] For TDD: This parameter is absent and it is equal to the downlink frequency.
ul-Bandwidth Parameter: Uplink bandwidth [36.101]. Value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. For TDD this parameter is absent and it is equal to the downlink bandwidth.
additionalSpectrumEmission Defined in [36.101]
mbsfn-SubframeConfiguration Defines the subframes that are reserved for MBSFN in downlink
radioFrameAllocation Radio-frames that contain MBSFN subframes occur when equation *SFN* mod *radioFrameAllocationPeriod* = *radioFrameAllocationOffset* is satisfied. n1 denotes value 1, n2 denotes value 2, and so on. When *fourFrames* is used, 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 *radioFrameAllocation.*
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.

Editor's note: The behaviour of Rel-8 UE when one of the two spare values is received for *ul-Bandwidth* is FFS.

– *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},
        speedDependentReselection           SEQUENCE {
            mobilityStateParameters             MobilityStateParameters,
            speedDependentScalingParametersHyst SEQUENCE {
                q-HystSF-Medium                     ENUMERATED {
```

```
                                                db-6, dB-4, db-2, db0,
                                                db2, db4, db6},
                q-HystSF-High                   ENUMERATED {
                                                db-6, dB-4, db-2, db0, db2,
                                                db4, db6}
            }
        }                                       OPTIONAL,                           -- Need OP
        sameRefSignalsInNeighbour           BOOLEAN
    },
    cellReselectionServingFreqInfo      SEQUENCE {
        s-NonIntraSearch                    ReselectionThreshold    OPTIONAL,       -- Need OP
        threshServingLow                    ReselectionThreshold,
        cellReselectionPriority             INTEGER (0..7)          OPTIONAL        -- Need FFS
    },
    intraFreqCellReselectionInfo        SEQUENCE {
        q-RxLevMin                          INTEGER (-70..-22),
        p-Max                               P-Max                   OPTIONAL,        -- need OP
        s-IntraSearch                       ReselectionThreshold    OPTIONAL,       -- Need OP
        measurementBandwidth                MeasurementBandwidth    OPTIONAL,       -- Need OP
        neighbourCellConfiguration          NeighbourCellConfiguration,
        t-ReselectionEUTRAN                 INTEGER (0..7),
        speedDependentScalingParameters         SEQUENCE {
            t-ReselectionEUTRAN-SF-Medium           ENUMERATED {oDot25, oDot5, oDot75, lDot0},
            t-ReselectionEUTRAN-SF-High             ENUMERATED {oDot25, oDot5, oDot75, lDot0}
        }                                                       OPTIONAL        -- Need OD
    },
    ...
}

-- 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.
speedDependentReselection Speed dependent reselection parameters. If this field is absent, i.e, *mobilityStateParameters* is also not present, UE behaviour is specified in TS 36.304 [4]
q-HystSF-Medium Parameter "Speed dependent ScalingFactor for Q_{hyst} for medium mobility state" in 36.304 [4]. Additional hysteresis applied in Medium Mobility state to Q_{hyst} as defined in [4]. In db. Value db-6 corresponds to -6dB, db-4 corresponds to -4dB and so on.
q-HystSF-High Parameter "Speed dependent ScalingFactor for Q_{hyst} for high mobility state" in 36.304 [4]. Additional hysteresis applied in High Mobility state to Q_{hyst} as defined in [4]. In db. Value db-6 corresponds to -6dB, db-4 corresponds to -4dB and so on.
speedDependentScalingParameters Speed dependent scaling parameters. If the field is not present, the UE behaviour is specified in [4].
speedDependentScalingParametersHyst Speed dependent scaling parameters for *q-Hyst*.
t-ReselectionEUTRAN Parameter "$Treselection_{EUTRAN}$" in 36.304 [4]. Cell reselection timer value $Treselection_{RAT}$ for E-UTRAN. In seconds
t-ReselectionEUTRAN-SF-Medium Parameter "Speed dependent ScalingFactor for $Treselection_{EUTRAN}$ for medium mobility state" in 36.304 [4]. The field *t-ReselectionEUTRAN* is multiplied with this factor if the UE is in Medium Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
t-ReselectionEUTRAN-SF-High Parameter "Speed dependent ScalingFactor for $Treselection_{EUTRAN}$ for high mobility state" in 36.304 [4]. The field *t-ReselectionEUTRAN* is multiplied with this factor if the UE is in High Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
s-IntraSearch Parameter $\mathbf{S_{intrasearch}}$, see [4]. If the field is not present, the UE behaviour is specified in [4].
sameRefSignalsInNeighbour Valid only in TDD operation [RAN1 spec; FFS]. If TRUE: the UE may assume that the same reference signals are available in neighbour cells as in serving cell.
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 [4].
threshServingLow Parameter $Thresh_{serving,\ low}$ [4].
cellReselectionPriority Parameter "priority" in 36.304 [4]. Absolute priority of the serving layer (0 means: lowest priority)
intraFreqcellReselectionInfo Cell re-selection information common for intra-frequency cells
q-RxLevMin Parameter $Q_{rxlevmin}$ in 36.304 [4]. Actual value $Q_{rxlevmin}$ = IE value * 2 [dBm]. Specifies the minimum required Rx RSRP level for the intra-frequency neighbouring E-UTRA cells.
p-Max *Paramter: pmax* to be used for the intra-frequency neighbouring E-UTRA cells. If *pmax* is absent, the maximum power according to the UE capability is used.
measurementBandwidth Measurement bandwidth information common for all neighbouring cells on the serving frequency. 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 {
    intraFreqNeighbouringCellList       IntraFreqNeighbouringCellList       OPTIONAL,   -- Need FFS
```

```
    intraFreqBlacklistedCellList        IntraFreqBlacklistedCellList        OPTIONAL,   -- Need FFS
    csg-PCI-Range                       PhysicalCellIdentityAndRange        OPTIONAL,   -- Cond CSG
    ...
}

IntraFreqNeighbouringCellList ::=       SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE {
    physicalCellIdentity                    PhysicalCellIdentity,
    q-OffsetCell                            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},
    ...
}

IntraFreqBlacklistedCellList ::=        SEQUENCE (SIZE (1..maxCellBlack)) OF SEQUENCE {
    physicalCellIdentityAndRange            PhysicalCellIdentityAndRange
}

-- ASN1STOP
```

***SystemInformationBlockType4* field descriptions**
intraFreqNeighbouringCellList List of intra-frequency neighbouring cells with specific cell re-selection parameters.
q-OffsetCell Parameter "Qoffset$_{s,n}$" in TS 36.304 [4]. The value in dB. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
intraFreqBlacklistedCellList List of blacklisted intra-frequency neighbouring cells
csg-PCI-Range Set of PCIs reserved for CSG cells.

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 SEQUENCE {
    eutra-CarrierFreq                   EUTRA-DL-CarrierFreq,
    q-RxLevMin                          INTEGER (-70..-22),
    p-Max                               P-Max                   OPTIONAL,       -- need OP
    t-ReselectionEUTRAN                 INTEGER (0..7),
    speedDependentScalingParameters     SEQUENCE {
        t-ReselectionEUTRAN-SF-Medium       ENUMERATED {oDot25, oDot5, oDot75, lDot0},
        t-ReselectionEUTRAN-SF-High         ENUMERATED {oDot25, oDot5, oDot75, lDot0}
    }                                                                   OPTIONAL,       -- need OD
    threshX-High                        ReselectionThreshold,
    threshX-Low                         ReselectionThreshold,
    measurementBandwidth                MeasurementBandwidth,
    cellReselectionPriority             INTEGER (0..7)                  OPTIONAL,   -- Need FFS
    q-OffsetFreq                        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, spare1}               DEFAULT dB0,
```

```
    interFreqNeighbouringCellList       InterFreqNeighbouringCellList   OPTIONAL,   -- Need OD
    interFreqBlacklistedCellList        InterFreqBlacklistedCellList    OPTIONAL,   -- Need OD
    ...
}

InterFreqNeighbouringCellList ::=   SEQUENCE (SIZE (1..maxCellInter)) OF SEQUENCE {
    physicalCellIdentity                PhysicalCellIdentity,
    q-OffsetCell                        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}
}

InterFreqBlacklistedCellList ::=    SEQUENCE (SIZE (1..maxCellBlack)) OF SEQUENCE {
    physicalCellIdentityAndRange        PhysicalCellIdentityAndRange
}

-- ASN1STOP
```

***SystemInformationBlockType5* field descriptions**
q-RxLevMin Parameter $Q_{rxlevmin}$ in TS 36.304 [4]. Actual value $Q_{rxlevmin}$ = IE value * 2 [dBm]. Specifies the minimum required Rx RSRP level for the neighbouring E-UTRA cells on this carrier frequency.
p-Max Parameter: Pmax in TS 36.304 [4]. Pmax to be used for the neighbouring E-UTRA cells on this carrier frequency.. If *pmax* is absent, the maximum power according to the UE capability is used.
threshX-High Parameter "$Thres_{x,high}$" [36.304].
threshX-Low Parameter "$Thres_{x,low}$" [36.304].
speedDependentScalingParameters Speed dependent scaling parameters. If the field is not present, the UE behaviour is specified in [4]
t-ReselectionEUTRAN Parameter "$Treselection_{EUTRAN}$" in TS 36.304 [4]. Cell reselection timer value $Treselection_{RAT}$ for E-UTRAN. In seconds
t-ReselectionEUTRAN-SF-Medium Parameter "Speed dependent ScalingFactor for $Treselection_{EUTRAN}$ for medium mobility state" in TS 36.304 [4]. The field *t-ReselectionEUTRAN* is multiplied with this factor if the UE is in Medium Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
t-ReselectionEUTRAN-SF-High Parameter "Speed dependent ScalingFactor for $Treselection_{EUTRAN}$ for high mobility state" in TS 36.304 [4]. The field *t-ReselectionEUTRAN* is multiplied with this factor if the UE is in High Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
measurementBandwidth Measurement bandwidth common for all neighbouring cells on the frequency.
cellReselectionPriority Parameter "priority" in TS 36.304 [4]. Absolute priority of the E-UTRA carrier frequency (0 means: lowest priority)
q-OffsetFreq Parameter "$Qoffset_{frequency}$" in TS 36.304 [4], value in dB. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
interFreqNeighbouringCellList List of inter-frequency neighbouring cells with specific cell re-selection parameters.
q-OffsetCell Parameter "$Qoffset_{s,n}$" in TS 36.304 [4], value in dB. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
interFreqBlacklistedCellList 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 as well as cell specific re-selection parameters.

Editor's note: In accordance with TS 36.300, cell specific parameters are not included in this SIB.

SystemInformationBlockType6 information element

```
-- ASN1START

SystemInformationBlockType6 ::=     SEQUENCE {
    utra-FDD-CarrierFreqList            UTRA-FDD-CarrierFreqList    OPTIONAL,           -- Need OD
    utra-TDD-CarrierFreqList            UTRA-TDD-CarrierFreqList    OPTIONAL,           -- Need OD
    t-ReselectionUTRA                   INTEGER (0..7),
    speedDependentScalingParameters     SEQUENCE {
        t-ReselectionUTRA-SF-Medium         ENUMERATED {oDot25, oDot5, oDot75, lDot0},
        t-ReselectionUTRA-SF-High           ENUMERATED {oDot25, oDot5, oDot75, lDot0}
    }                                                       OPTIONAL,           -- need OD
    ...
}

UTRA-FDD-CarrierFreqList ::=        SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF SEQUENCE {
    utra-CarrierFreq                    UTRA-DL-CarrierFreq,
    utra-CellReselectionPriority        INTEGER (0..7)                  OPTIONAL, -- Need FFS
    threshX-High                        ReselectionThreshold,
    threshX-Low                         ReselectionThreshold,
    q-RxLevMin                          INTEGER (-70..-22),         -- need FFS
    maxAllowedTxPower                   INTEGER (-50..33),
    q-QualMin                           INTEGER (-24..0),
    ...
}

UTRA-TDD-CarrierFreqList ::=        SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF SEQUENCE {
    utra-CarrierFreq                    UTRA-DL-CarrierFreq,
    utra-CellReselectionPriority        INTEGER (0..7)                  OPTIONAL, -- Need FFS
    threshX-High                        ReselectionThreshold,
    threshX-Low                         ReselectionThreshold,
    q-RxLevMin                          INTEGER (-70..-22),         -- need FFS
    maxAllowedTxPower                   INTEGER (-50..33),
    ...
}

-- ASN1STOP
```

***SystemInformationBlockType6* field descriptions**
t-ReselectionUTRA Parameter "$Treselection_{UTRAN}$" in TS 36.304 [4]. Cell reselection timer value $Treselection_{RAT}$ for UTRA. In seconds
speedDependentScalingParameters Speed dependent scaling parameters. If the field is not present, the UE behaviour is specified in [4]
t-ReselectionUTRA-SF-Medium Parameter "Speed dependent ScalingFactor for $Treselection_{UTRAN}$ for medium mobility state" in TS 36.304 [4]. The field *t-ReselectionUTRA* is multiplied with this factor if the UE is in Medium Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
t-ReselectionUTRA-SF-High Parameter "Speed dependent ScalingFactor for $Treselection_{UTRAN}$ for high mobility state" in TS 36.304 [4]. The field *t-ReselectionUTRA* is multiplied with this factor if the UE is in High Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
utra-CellReselectionPriority Parameter "priority" in TS 36.304 [4]. Absolute priority of the RAT (0 means: lowest priority)
utra-FDD-CarrierFreqList List of carrier frequencies of UTRA FDD.
utra-TDD-CarrierFreqList List of carrier frequencies of UTRA TDD.
threshX-High Parameter "$Thres_{x,high}$" in TS 36.304 [4].
threshX-Low Parameter "$Thres_{x,low}$" in TS 36.304 [4].
q-RxLevMin Parameter $Q_{rxlevmin}$, see TS 36.304 [4]. Actual value = IE value * 2+1. Specifies the minimum required Rx level in the cell expressedin dBm
maximumAllowedTxPower In dBm
q-QualMin Parameter "*Qqualmin*" in TS 25.304 [40]. In dBm

– *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                  INTEGER (0..7),
    speedDependentScalingParameters     SEQUENCE {
        t-ReselectionGERAN-SF-Medium        ENUMERATED {oDot25, oDot5, oDot75, lDot0},
        t-ReselectionGERAN-SF-High          ENUMERATED {oDot25, oDot5, oDot75, lDot0}
    }                                                                   OPTIONAL,   -- need OD
    geran-NeigbourFreqList              GERAN-NeigbourFreqList          OPTIONAL,   -- Need OD
    ...
}

GERAN-NeigbourFreqList ::=          SEQUENCE (SIZE (1..maxGNFG)) OF GERAN-BCCH-Group

GERAN-BCCH-Group ::=                SEQUENCE {
    geran-BCCH-FrequencyGroup           GERAN-CarrierFreqList,
    geran-BCCH-Configuration            SEQUENCE {
        geran-CellReselectionPriority       INTEGER (0..7)              OPTIONAL,   -- Need FFS
        ncc-Permitted                       BIT STRING (SIZE (8)),
        q-RxLevMin                          INTEGER (0..31),
        p-MaxGERAN                          INTEGER (0..39)             OPTIONAL,   --  need OP
        threshX-High                        ReselectionThreshold,
        threshX-Low                         ReselectionThreshold
    },
    ...
}

-- ASN1STOP
```

Editor's note RAN2 has agreed not to provide cell specific re-selection parameters for GSM/ GERAN neighbours. To be confirmed by GERAN/ RAN4

***SystemInformationBlockType7* field descriptions**
geran-NeigbourFreqList 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.
geran-BCCH-FrequencyGroup The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.
geran-BCCH-Configuration Defines the set of cell reselection parameters for the group of GERAN carrier frequencies. In the first element of the *geran-NeigbourFreqList* field, a complete set of cell reselection parameters shall be provided in the *geran-BCCH-Configuration* field. In subsequent elements of the *geran-NeigbourFreqList* field, value(s) from the presiding element is used as default, if one or more of the cell reselection parameters in the *geran-BCCH-Configuration* field are absent.
geran-CellReselectionPriority Parameter "priority" in TS 36.304 [4]. Absolute priority of the RAT (0 means: lowest priority)
t-ReselectionGERAN Parameter "$Treselection_{GERAN}$" in TS 36.304 [4]. Cell reselection timer value $Treselection_{RAT}$ for GERAN. In seconds
speedDependentScalingParameters Speed dependent scaling parameters. If the field is not present, the UE behaviour is specified in [4]
t-ReselectionGERAN-SF-Medium Parameter "Speed dependent ScalingFactor for $Treselection_{GERAN}$ for medium mobility state" in TS 36.304 [4]. The field *t-ReselectionGERAN* is multiplied with this factor if the UE is in Medium Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75, 1 corresponds to 1.
t-ReselectionGERAN-SF-High Parameter "Speed dependent ScalingFactor for $Treselection_{GERAN}$ for high mobility state" in TS 36.304 [4]. The field *t-ReselectionGERAN* is multiplied with this factor if the UE is in High Mobility state as defined in [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
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 36.304 [4]. The actual value of $Q_{rxlevmin}$ in dBm = (IE value * 2) – 119.
p-MaxGERAN Maximum allowed transmission power for GERAN on an uplink carrier frequency 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 "$Thres_{x,high}$" in TS 36.304 [4].
threshX-Low Parameter "$Thres_{x,low}$" 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 {
    cdma2000-SystemTimeInfo             CDMA2000-SystemTimeInfo     OPTIONAL,           -- Need OD
    searchWindowSize                    INTEGER (0..15)                 OPTIONAL,       -- Need OD
    hrpd-Parameters                     SEQUENCE {
        hrpd-PreRegistrationInfo            HRPD-PreRegistrationInfo,
        hrpd-CellReselectionParameters      SEQUENCE {
            hrpd-BandClassList                  HRPD-BandClassList,
            hrpd-NeighborCellList               CDMA2000-NeighbourCellList,
            t-ReselectionCDMA-HRPD              INTEGER (0..7),
            speedDependentScalingParameters     SEQUENCE {
                t-ReselectionCDMA-HRPD-SF-Medium    ENUMERATED {oDot25, oDot5, oDot75, lDot0},
                t-ReselectionCDMA-HRPD-SF-High      ENUMERATED {oDot25, oDot5, oDot75, lDot0}
            }                                                       OPTIONAL        -- need OD
        }       OPTIONAL                                                            --  Need OD
    }       OPTIONAL,                                                               --  Need OD
    oneXRTT-Parameters                  SEQUENCE {
        oneXRTT-CSFB-RegistrationInfo       OneXRTT-CSFB-RegistrationInfo   OPTIONAL,   -- Need OD
```

```
        oneXRTT-LongCodeState               BIT STRING (SIZE (42))  OPTIONAL,       -- Need OD
        oneXRTT-CellReselectionParameters   SEQUENCE {
            oneXRTT-BandClassList               OneXRTT-BandClassList,
            oneXRTT-NeighborCellList            CDMA2000-NeighbourCellList,
            t-ReselectionCDMA-OneXRTT           INTEGER (0..7),
            speedDependentScalingParameters     SEQUENCE {
                t-ReselectionCDMA-OneXRTT-SF-Medium  ENUMERATED {oDot25, oDot5, oDot75, lDot0},
                t-ReselectionCDMA-OneXRTT-SF-High    ENUMERATED {oDot25, oDot5, oDot75, lDot0}
            }                                                       OPTIONAL        -- need OD
        }       OPTIONAL                                                            -- Need OD
    }       OPTIONAL,                                                               -- Need OD
    ...
}

CDMA2000-NeighbourCellList ::=      SEQUENCE (SIZE (1..16)) OF SEQUENCE {
    bandClass                           CDMA2000-Bandclass,
    frequencyList                       CDMA2000-NeighbourCellsPerBandclass
}

CDMA2000-NeighbourCellsPerBandclass ::= SEQUENCE (SIZE (1..16)) OF SEQUENCE {
    frequency                           INTEGER (0..2047),
    cellIdList                          CDMA2000-CellIdList
}

CDMA2000-CellIdList ::=             SEQUENCE (SIZE (1..16)) OF CDMA2000-CellIdentity

HRPD-BandClassList ::=              SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF SEQUENCE {
    hrpd-BandClass                      CDMA2000-Bandclass,
    hrpd-CellReselectionPriority        INTEGER (0..7),
    threshX-High                        INTEGER (0..63),
    threshX-Low                         INTEGER (0..63),
    ...
}

OneXRTT-BandClassList ::=           SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF SEQUENCE {
    oneXRTT-BandClass                   CDMA2000-Bandclass,
    oneXRTT-CellReselectionPriority     INTEGER (0..7),
    threshX-High                        INTEGER (0..63),
    threshX-Low                         INTEGER (0..63),
    ...
}

-- ASN1STOP
```

***SystemInformationBlockType8* field descriptions**
cdma2000-SystemTimeInfo Information on CDMA2000 system time. This field is excluded when estimating changes in system information, i.e. changes of *cdma2000-SystemTimeInfo* should neither result in system information change notifications nor in a modification of the value tag in SIB1.
searchWindowSize The search window size is a CDMA parameter to be used to assist in searching for the neighboring pilots. For values see [25, Table 2.6.6.2.1-1] and [26, Table 8.7.6.2-4].
hrpd-Parameters The cell reselection parameters applicable only to HRPD systems
hrpd-PreRegistrationInfo The HRPD Pre-Registration Information tells the UE if it should pre-register with the HRPD network and identifies the Pre-registration zone to the UE
hrpd-CellReselectionParameters cell reselection parameters applicable only to HRPD system
hrpd-BandClassList List of CDMA2000 frequency bands
hrpd-BandClass Identifies the HRPD Frequency Band in which the HRPD Carrier can be found. Details can be found in [24, Table 1.5]
hrpd-CellReselectionPriority Absolute priority of the RAT (0 means: lowest priority)
threshX-High Parameter "$Thres_{x,high}$" in TS 36.304 [4]. This specifies the high threshold used in reselection towards this CDMA2000 HRPD 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 [25]

***SystemInformationBlockType8* field descriptions**
threshX-Low Parameter "$Thres_{x,low}$" in TS 36.304 [4]. This specifies the low threshold used in reselection towards this CDMA2000 HRPD 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 [25]
t-ReselectionCDMA-HRPD Parameter "$Treselection_{CDMA\_HRPD}$" in TS 36.304 [4]. The HRPD cell reselection timer value in seconds
hrpd-NeighborCellList List of HRPD neighbouring cells. The total number of HRPD neighbour cells is limited to 32.
oneX-RTT-Parameters cell reselection parameters applicable only to 1XRTT system
oneXRTT-CSFB-RegistrationInfo The CSFB to 1xRTT Registration Information tells the mobile if it should register with the 1xRTT network and identifies the 1xRTT System ID to the UE
oneXRTT-LongCodeState The state of long code generation registers in 1XRTT system as defined in [C.S0002-A, Section 1.3] at $\lceil t/10 \rceil \times 10 + 320$ ms, where *t* equals to the *cdma-SystemTime*. This information is required by the UE to perform SRVCC handover to 1xRTT. This field is excluded when estimating changes in system information, i.e. changes of *oneXRTT-LongCodeState* should neither result in system information change notifications nor in a modification of the value tag in SIB1.
oneXRTT-CellReselectionParameters Cell reselection parameters applicable only to 1xRTT system
oneXRTT-BandClassList List of CDMA2000 frequency bands
oneXRTT-BandClass Identifies the 1xRTT Frequency Band in which the 1xRTT Carrier can be found. Details can be found in [24, Table 1.5]
oneXRTT-CellReselectionPriority Absolute priority of the RAT (0 means: lowest priority)
threshX-High Parameter "$Thres_{x,high}$" in TS 36.304 [4]. This specifies the high threshold used in reselection towards CDMA2000 1xRTT 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 [25]
threshX-Low Parameter "$Thres_{x,low}$" in TS 36.304 [4]. This specifies the low threshold used in reselection towards CDMA2000 1xRTT 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 [25]
t-ReselectionCDMA-OneXRTT Parameter "$Treselection_{CDMA\_1xRTT}$" in TS 36.304 [4]. The 1XRTT cell reselection timer value in seconds
oneXRTT-NeighborCellList List of 1xRTT neighbouring cells. The total number of 1xRTT neighbour cells is limited to 32.
CDMA2000-NeighbourCellList List of CDMA2000 1xRTT or of CDMA2000 HRPD neighboring cells
bandClass Identifies the CDMA2000 Frequency Band in which the CDMA2000 cells can be found, see [24].
frequencyList List of carrier frequencies and neighbor cell ids in each frequency within a CDMA2000 Band, see [33].
frequency Identifies the carrier frequency within a CDMA2000 Band, see [33].
cellIdList Identifies the list of CDMA cells ids, see [33].

– *SystemInformationBlockType9*

The IE *SystemInformationBlockType9* contains a home eNB identifier (HNBID).

***SystemInformationBlockType9* information element**

```
-- ASN1START

SystemInformationBlockType9 ::=     SEQUENCE {
    hnbid                               OCTET STRING (SIZE(1..48)),
    ...
}

-- ASN1STOP
```

***SystemInformationBlockType9* field descriptions**
hnbid
Carries the identifier 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)),
    warningSecurityInformation          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 [37], [39] and encoded according to [37] and so on.
serialNumber
Identifies variations of an ETWS notification. The first bit contains bit 1 of the equivalent IE defined in [37], [39] and encoded according to [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 [37], [39] and encoded according to [37], and so on.
warningSecurityInformation
Provides security information for the ETWS notification. The first octet contains octet 1 of the equivalent IE defined in [37], [39] and encoded according to [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)),
    ...
}

-- 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 [37, 39] and encoded according to [37] and so on.
serialNumber
Identifies variations of an ETWS notification. The first bit contains bit 1 of the equivalent IE defined in [37, 39] and encoded according to [37] and so on.

***SystemInformationBlockType11* field descriptions**
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 [39]. The first octet of the *Warning Message Contents* IE is equivalent to the *CB data* IE defined in and encoded according to [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 [37, 39] and encoded according to [38].

6.3.2 Radio resource control information elements

– *AntennaInformation*

The IE *AntennaInformation* is used to specify the antenna configuration to be applied by the UE.

***AntennaInformation* information elements**

```
-- ASN1START

AntennaInformationCommon ::=        SEQUENCE {
    antennaPortsCount                   ENUMERATED {an1, an2, an4, spare1}
}

AntennaInformationDedicated ::= 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{
            disable                         NULL,
            enable                          ENUMERATED {closedLoop, openLoop}
    }
}

-- ASN1STOP
```

***AntennaInformation* field descriptions**
antennaPortsCount Parameter represents the number of cell specific antenna ports where an1 corresponds to 1, an2 to 2 antenna ports etc. see TS 36.211, 6.2.1. A UE in IDLE mode acquires the information about the number of transmit antenna ports according to TS 36.212, 5.3.1.1.
transmissionMode Points to one of Transmission modes defined in TS 36.213, 7.1 where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.
codebookSubsetRestriction Parameter: *codebookSubsetRestriction,* see TS 36.213 [23, 7.2] and TS 36.211 [21, 6.3.4.2.3]
ue-TransmitAntennaSelection *disable* indicates that UE transmit antenna selection is disabled. If *enable* then 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 applicable.

– *CQI-Reporting*

The IE *CQI-Reporting* is used to specify the CQI reporting configuration.

***CQI-Reporting* information elements**

```
-- ASN1START

CQI-Reporting ::=               SEQUENCE {
    cqi-ReportingModeAperiodic          ENUMERATED {
                                            rm12, rm20, rm22, rm30, rm31,
                                            spare3, spare2, spare1},
    nomPDSCH-RS-EPRE-Offset             INTEGER (-1..6),
    cqi-ReportingPeriodic               CQI-ReportingPeriodic   OPTIONAL                -- Need ON
}

CQI-ReportingPeriodic ::=       CHOICE {
    disable                         NULL,
    enable                          SEQUENCE {
        cqi-PUCCH-ResourceIndex             INTEGER (0..767),
        cqi-pmi-ConfigIndex                 INTEGER (0..511),
        cqi-FormatIndicatorPeriodic         CHOICE {
            widebandCQI                         NULL,
            subbandCQI                          SEQUENCE {
                k                                   INTEGER (1..4)
            }
        },
        ri-ConfigIndex                      INTEGER (0..1023),
        simultaneousAckNackAndCQI           BOOLEAN
    }
}

-- ASN1STOP
```

***CQI-Reporting* 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, 7.2.2-1A].
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-ReportingModeAperiodic 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].

– *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),
        prioritizedBitRate                  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 OD
    ...
    }       OPTIONAL                                                                    -- Cond UL
}

-- ASN1STOP
```

LogicalChannelConfig field descriptions
priority Logical channel priority in [36.321]. Value is an integer.
prioritizedBitRate Parameter: *Prioritized Bit Rate* [36.321]. 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.
bucketSizeDuration Parameter: *Bucket Size Duration* [36.321]. 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 [36.321].

Conditional presence	Explanation
UL	The field is mandatory present for UL logical channels; otherwise it is not applicable.

– *MAC-MainConfiguration*

The IE *MAC-MainConfiguration* is used to specify the MAC main configuration for signalling and data radio bearers.

MAC-MainConfiguration information element

```
-- ASN1START

MAC-MainConfiguration ::=   SEQUENCE {
    dl-SCH-Configuration                SEQUENCE {
    }       OPTIONAL,                                                       -- Need ON
    ul-SCH-Configuration                SEQUENCE {
        maxHARQ-Tx                          ENUMERATED {
                                                n1, n2, n3, n4, n5, n6, n7, n8,
                                                n10, n12, n16, n20, n24, n28,
                                                spare2, spare1}     OPTIONAL,     -- Cond ConnSU
        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-Configuration                   CHOICE {
        disable                             NULL,
        enable                              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 {
                                                sf1, sf2, sf4, sf6, sf8, sf16,
                                                sf24, sf33},
            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                            CHOICE {
                disable                             NULL,
                enable                              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 ON
        }
    }       OPTIONAL,                                                           -- need ON
    timeAlignmentTimerDedicated         TimeAlignmentTimer,
    phr-Configuration                   CHOICE {
        disable                             NULL,
        enable                              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
    ...
}

-- ASN1STOP
```

***MAC-MainConfiguration* field descriptions**
maxHARQ-Tx Parameter: *max-HARQ-Tx* [36.321]. If absent in the *RRCConnectionSetup* message, the default value as defined in 9.2.2 applies.
periodicBSR-Timer Parameter: *PERIODIC_BSR_TIMER* [36.321]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on.
retxBSR-Timer Parameter: *RETX_BSR_TIMER*, see 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 Configures TTI bundling on and off. Can be configured for FDD and for TDD only for configurations 0, 1 and 6.
longDRX-CycleStartOffset Parameters: *Long DRX Cycle* and *DRX Start Offset* [36.321]. *Long DRX Cycle* value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 subframes and so on. If shortDRX-Cycle is configured, the value shall be a multiple of the shortDRX-Cycle value. *DRX Start Offset* value in integer. In TDD, this can point to a DL or UL sub-frame.
onDurationTimer Parameter: *On Duration Timer* [36.321]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH subframe, psf2 corresponds to 2 PDCCH sub-frames and so on.
drx-InactivityTimer Parameter: *DRX Inactivity Timer* [36.321]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH subframe, psf2 corresponds to 2 PDCCH sub-frames and so on.
drx-RetransmissionTimer Parameter: *DRX Retransmission Timer* [36.321]. Value in number of PDCCH sub-frames.
shortDRX-Cycle Short DRX cycle in [36.321]. Value in number of sub-frames. Value sf2 corresponds to 2 sub-frames, sf5 corresponds to 5 subframes and so on.
drxShortCycleTimer Parameter: *DRX Short Cycle Timer* [36.321]. 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 Parameter: *PERIODIC_PHR_TIMER* [36.321]. Value in number of sub-frames. Value sf10 corresponds to 10 subframes, sf20 corresponds to 20 subframes and so on.
prohibitPHR-Timer Parameter: *PROHIBIT PHR TIMER* [36.321]. Value in number of sub-frames. Value sf0 corresponds to 0 subframes, sf100 corresponds to 100 subframes and so on.
dl-PathLossChange Parameter: *DL PathlossChange* [36.321]. Value in dB. Value dB1 corresponds to 1 dB, dB3 corresponds to 3 dB and so on.

Conditional presence	**Explanation**
ConnSU	The field is mandatory default if the field is included in *RRCConnectionSetup*; otherwise it is optionally present, continue.

– *PDCP-Configuration*

The IE *PDCP-Configuration* is used to set the configurable PDCP parameters for data radio bearers.

***PDCP-Configuration* information element**

```
-- ASN1START

PDCP-Configuration ::=              SEQUENCE {
    discardTimer                        ENUMERATED {
                                            ms50, ms100, ms150, ms300, ms500,
                                            ms750, ms1500, infinity
    }                                                       OPTIONAL,  -- Cond Setup, range FFS
    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-Configuration* field descriptions**
pdcp-SN-Size Indicates the length of the PDCP Sequence Number as specified in [8].
maxCID Highest context ID number to be used in the uplink by the UE compressor.
profiles Profiles used by both compressor and decompressor in both UE and E-UTRAN. List of indices to ROHC profiles specified in [8]. Profile 0x0000 shall always be supported when the use of ROHC is configured. If two ROHC profile identifiers with the same 8 LSB's are signalled, only the profile corresponding to the highest value should be applied

Conditional presence	Explanation
Setup	The field is mandatory present in case of radio bearer setup. Otherwise the field is not applicable.
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 in case of reconfiguration of a PDCP entity at handover for a radio bearer configured with RLC AM, continue. Otherwise the field is not applicable.
Rlc-UM	The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC UM, continue. Otherwise the field is not applicable.

– *PDSCH-Configuration*

The IE *PDSCH-Configuration* is used to specify the PDSCH configuration

***PDSCH-Configuration* information element**

```
-- ASN1START

PDSCH-ConfigCommon::=       SEQUENCE {
    referenceSignalPower                INTEGER (-60..50),
    p-b                                 ENUMERATED {pb0, pb1, pb2, pb3}
}

PDSCH-ConfigDedicated::=        SEQUENCE {
    p-a                                 ENUMERATED {
                                            dB-6, dB-4dot77, dB-3, dB-1dot77,
                                            dB0, dB1, dB2, dB3 }
}

-- ASN1STOP
```

***PDSCH-Configuration* field descriptions**
referenceSignalPower Parameter: *Downlink Reference-signal power 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 -4dot77 dB etc.
p-b Parameter: P_B see TS 36.213 [23, Table 5.2-1]. Value pb0 corresponds to 0, pb1 to 1 etc where the actual value depends of the number of antennas used.

– *PHICH-Configuration*

The IE *PHICH-Configuration* is used to specify the PHICH configuration.

***PHICH-Configuration* information element**

```
-- ASN1START

PHICH-Configuration ::=             SEQUENCE {
    phich-Duration                      ENUMERATED {normal, extended},
    phich-Resource                      ENUMERATED {oneSixth, half, one, two}
}

-- ASN1STOP
```

***PHICH-Configuration* field descriptions**
phich-Duration Parameter: PHICH-*Duration*, see TS 36.211, 6.9.3. Table 6.9.3-1 provides duration for MBSFN and non-MBSFN subframes.
phich-Resource Parameter: *Ng*, see TS 36.211, 6.9. OneSixth, half, one, two correspond to $N_g \in \{1/6, 1/2, 1, 2\}$

– *PhysicalConfigDedicated*

The IE *PhysicalConfigDedicated* is used to specify the UE specific physical channel configuration.

***PhysicalConfigDedicated* information element**

```
-- ASN1START

PhysicalConfigDedicated ::=         SEQUENCE {
    pdsch-Configuration                 PDSCH-ConfigDedicated           OPTIONAL,       -- need ON
    pucch-Configuration                 PUCCH-ConfigDedicated           OPTIONAL,       -- need ON
    pusch-Configuration                 PUSCH-ConfigDedicated           OPTIONAL,       -- need ON
    uplinkPowerControl                  UplinkPowerControlDedicated     OPTIONAL,       -- need ON
    tpc-PDCCH-ConfigPUCCH               TPC-PDCCH-Configuration         OPTIONAL,       -- need ON
    tpc-PDCCH-ConfigPUSCH               TPC-PDCCH-Configuration         OPTIONAL,       -- need ON
    cqi-Reporting                       CQI-Reporting                   OPTIONAL,       -- need ON
    soundingRsUl-Config                 SoundingRsUl-ConfigDedicated    OPTIONAL,       -- need ON
    antennaInformation                  CHOICE {
        explicitValue                       AntennaInformationDedicated,
        defaultValue                        NULL
    }       OPTIONAL,                                                                   -- need ON
    schedulingRequestConfig             SchedulingRequest-Configuration OPTIONAL,       -- need ON
    ...
}

-- ASN1STOP
```

***PhysicalConfigDedicated* field descriptions**
antennaInformation The default antenna configuration is described 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].

– *PRACH-Configuration*

The IE *PRACH-ConfigurationSIB* and IE *PRACH-Configuration* are used to specify the PRACH configuration in the system information and in the mobility control information, respectively.

***PRACH-Configuration* information elements**

```
-- ASN1START

PRACH-ConfigurationSIB ::=          SEQUENCE {
    rootSequenceIndex                   INTEGER (0..837),
    prach-ConfigInfo                    PRACH-ConfigInfo
}

PRACH-Configuration ::=             SEQUENCE {
    rootSequenceIndex                   INTEGER (0..837),
    prach-ConfigInfo                    PRACH-ConfigInfo                    OPTIONAL    -- Need ON
}

PRACH-ConfigInfo ::=                SEQUENCE {
    prach-ConfigurationIndex            INTEGER (0..63),
    highSpeedFlag                       BOOLEAN,
    zeroCorrelationZoneConfig           INTEGER (0..15),
    prach-FrequencyOffset               INTEGER (0..104)
}

-- ASN1STOP
```

***PRACH-Configuration* field descriptions**
rootSequenceIndex Parameter: *Root-sequence-index*, see TS 36.211 [21, table 5.7.2-4 and 5.7.2-5]
prach-ConfigurationIndex Parameter: *PRACH configuration index*. For FDD, see TS 36.211 [21, 5.7.1: table 5.7.1-1 and 5.7.1-2] (providing mapping of Preamble format and PRACH configuration to PRACH Configuration Index). For TDD, see TS 36.211 [21, table 5.7.1-3]
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 table 5.7.2-3 for preamble format 4]
prach-FrequencyOffset Parameter: *prach-FrequencyOffset,* see TS 36.211, [21, 5.7.1]

– *PUCCH-Configuration*

The IE *PUCCH-ConfigCommon* and IE *PUCCH-ConfigDedicated* are used to specify the common and the UE specific PUCCH configuration respectively.

***PUCCH-Configuration* information elements**

```
-- ASN1START

PUCCH-ConfigCommon ::=              SEQUENCE {
    deltaPUCCH-Shift                    ENUMERATED {ds1, ds2, ds3, spare1},
    nRB-CQI                             INTEGER (0..63),
    nCS-AN                              INTEGER (0..7),
    n1PUCCH-AN                          INTEGER (0..2047)
```

```
}

PUCCH-ConfigDedicated ::=           SEQUENCE {
    ackNackRepetition                   CHOICE{
        disable                             NULL,
        enable                              SEQUENCE {
            repetitionFactor                    ENUMERATED { n2, n4, n6, spare1}
        }
    },
    tddAckNackFeedbackMode              ENUMERATED {bundling, multiplexing}
}

-- ASN1STOP
```

***PUCCH-Configuration* 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], where ncs0 corresponds to value 0; ncs1 corresponds to value 1 etc.
n1Pucch-AN
Parameter: $N_{PUCCH}^{(1)}$ see TS 36.213 [23, 10.1]
ackNackRepetition
Parameter indicates whether ACK/NACK repetition is enable or disabled 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.
tddAckNackFeedbackMode
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. This field is only applicable for TDD.

– *PUSCH-Configuration*

The IE *PUSCH-Configuration* is used to specify the PUSCH configuration

***PUSCH-Configuration* information element**

```
-- ASN1START

PUSCH-ConfigCommon ::=              SEQUENCE {
    pusch-ConfigBasic                   SEQUENCE {
        n-SB                                ENUMERATED {nsb1, nsb2, nsb3, nsb4},
        hoppingMode                         ENUMERATED {interSubFrame, intraAndInterSubFrame},
        pusch-HoppingOffset                 INTEGER (0..63),
        enable64Qam                         BOOLEAN
    },
    ul-ReferenceSignalsPUSCH            UL-ReferenceSignalsPUSCH
}

PUSCH-ConfigDedicated ::=           SEQUENCE {
    deltaOffset-ACK-Index                   INTEGER (0..15),
    deltaOffset-RI-Index                    INTEGER (0..15),
    deltaOffset-CQI-Index                   INTEGER (0..15)
}

-- ASN1STOP
```

***PUSCH-Configuration* field descriptions**
n-SB Parameter: N_{sb} see TS 36.211 [21, 5.3.4] where nsb1 corresponds to value 1 nsb2 corresponds to value 2 etc.
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 64 QAM is enabled while FALSE indicates that no 64 QAM is allowed.
deltaOffset-ACK-Index Parameter: $I_{offset}^{HARQ-ACK}$ see TS 36.213 [23, Table 8.6.3-1]
deltaOffset-RI-Index Parameter: I_{offset}^{RI} see TS 36.213 [23, Table 8.6.3-1]
deltaOffset-CQI-Index Parameter: I_{offset}^{CQI} see TS 36.213 [23, Table 8.6.3-1]

– *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 (1..64),
    ra-PRACH-MaskIndex                  INTEGER (0..15)
}

-- ASN1STOP
```

RACH-ConfigDedicated field descriptions
ra-PreambleIndex Explicitly signalled Random Access Preamble in TS 36.321 [6].
ra-PRACH-MaskIndex Explicitly signalled PRACH Mask Index in TS 36.321 [6].

– *RACH-ConfigCommon*

The IE *RACH-ConfigCommon* is used to specify the generic random access parameters.

***RACH-ConfigCommon* information element**

```
-- ASN1START

RACH-ConfigCommon ::=       SEQUENCE {
    preambleInformation                 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, spare1},
            messageSizeGroupA                   ENUMERATED {b56, b144, b208, spare1},
            messagePowerOffsetGroupB            ENUMERATED {minusinfinity, spare1},
            ...
        }           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-SupervisionInformation           SEQUENCE {
        preambleTransMax                    ENUMERATED {
                                                n3, n4, n5, n6, n7, n8, n10, n20, n50,
                                                n100, n200, spare5, spare4, spare3,
                                                spare2, spare1},
        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 [36.321]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.
preamblesGroupAConfig Provides the configuration for preamble grouping [36.321]. If the field is not signalled, the size of the random access preambles group A [36.321] is equal to *numberOfRA-Preambles*.
sizeOfRA-PreamblesGroupA Size of the random access preambles group A [36.321]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.
messageSizeGroupA Parameter: *MESSAGE_SIZE_GROUP_A* [36.321]. Value in bits. Value b56 corresponds to 56 bits, b144 corresponds to 144 bits and so on.
messagePowerOffsetGroupB Parameter: MESSAGE_POWER_OFFSET_GROUP_B [36.321]. Value minusinfinity corresponds to –infinity. Other values and step size are [FFS].
powerRampingStep Parameter: *POWER_RAMP_STEP* [36.321]. Value in dB. Value dB0 corresponds to 0 dB, dB2 corresponds to 2 dB and so on.
preambleInitialReceivedTargetPower Parameter: *PREAMBLE_INITIAL_RECEIVED_TARGET_POWER* [36.321]. Value in dBm. Value dBm-120 corresponds to -120 dBm, dBm-118 corresponds to -118 dBM and so on.
preambleTransMax Parameter: *PREAMBLE_TRANS_MAX* [36.321]. Value is an integer. Value n3 corresponds to 3, n4 corresponds to 4 and so on.
ra-ResponseWindowSize Duration of the RA response window [RA_WINDOW_BEGIN — RA_WINDOW_END] [36.321]. Value in subframes. Value sf2 corresponds to 2 subframes, sf3 corresponds to 3 subframes and so on.
mac-ContentionResolutionTimer Parameter: *Contention Resolution Timer* [36.321]. Value in subframes. Value sf8 corresponds to 8 subframes, sf16 corresponds to 16 subframes and so on.
maxHARQ-Msg3Tx Parameter: *max-HARQ-Msg3-Tx* [36.321], used for contention based random access. Value is an integer.

– RadioResource*ConfigCommon*

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-Configuration                  RACH-ConfigCommon,
    bcch-Configuration                  BCCH-Configuration,
    pcch-Configuration                  PCCH-Configuration,
    prach-Configuration                 PRACH-ConfigurationSIB,
    pdsch-Configuration                 PDSCH-ConfigCommon,
    pusch-Configuration                 PUSCH-ConfigCommon,
    pucch-Configuration                 PUCCH-ConfigCommon,
    soundingRsUl-Config                 SoundingRsUl-ConfigCommon           OPTIONAL,   -- Need OD,
    uplinkPowerControl                  UplinkPowerControlCommon,
    ul-CyclicPrefixLength               UL-CyclicPrefixLength,
    ...
}

RadioResourceConfigCommon ::=       SEQUENCE {
    rach-Configuration                  RACH-ConfigCommon                   OPTIONAL,   -- Need ON
    prach-Configuration                 PRACH-Configuration,
    pdsch-Configuration                 PDSCH-ConfigCommon                  OPTIONAL,   -- Need ON
    pusch-Configuration                 PUSCH-ConfigCommon,
    phich-Configuration                 PHICH-Configuration                 OPTIONAL,   -- Need ON
    pucch-Configuration                 PUCCH-ConfigCommon                  OPTIONAL,   -- Need ON
    soundingRsUl-Config                 SoundingRsUl-ConfigCommon           OPTIONAL,   -- Need ON
    uplinkPowerControl                  UplinkPowerControlCommon            OPTIONAL,   -- Need ON
    antennaInformationCommon            AntennaInformationCommon            OPTIONAL,   -- Need ON
    tdd-Configuration                   TDD-Configuration                   OPTIONAL,   -- need ON
    ul-CyclicPrefixLength               UL-CyclicPrefixLength,
    ...
}

BCCH-Configuration ::=              SEQUENCE {
    modificationPeriodCoeff             ENUMERATED {n2, n4, n8, spare}
}

PCCH-Configuration ::=              SEQUENCE {
    defaultPagingCycle                  ENUMERATED {
                                            rf32, rf64, rf128, rf256},
    nB                                  ENUMERATED {
                                            fourT, twoT, oneT, halfT, quarterT, oneEightT,
                                            onSixteenthT, oneThirtySecondT}
}

UL-CyclicPrefixLength ::=           ENUMERATED {len1, len2}

-- ASN1STOP
```

***RadioResourceConfigCommon* field descriptions**

BCCH-Configuration
modificationPeriodCoeff Actual modification period, expressed in number of radio frames= modificationPeriodCoeff * defaultPagingCycle. n2 corresponds to value 2, n4 corresponds to value 4 and n8 corresponds to value 8.

PCCH-Configuration
defaultPagingCycle Default paging cycle, referred to as '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 to derive the number of paging groups according to TS 36.304 *[4]*

UL-CyclicPrefixLength
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.

– *RadioResourceConfigDedicated*

The IE *RadioResourceConfigDedicated* is used to setup/modify/release RBs, to setup/modifiy transport channel configurations and to setup/modify physical channels

RadioResourceConfigDedicated information element

```
-- ASN1START

RadioResourceConfigDedicated ::=        SEQUENCE {
    srb-ToAddModifyList                 SRB-ToAddModifyList         OPTIONAL,       -- need ON
    drb-ToAddModifyList                 DRB-ToAddModifyList         OPTIONAL,       -- need ON
    drb-ToReleaseList                   DRB-ToReleaseList           OPTIONAL,       -- need ON
    mac-MainConfig                      CHOICE {
            explicitValue                   MAC-MainConfiguration,
            defaultValue                    NULL
    }       OPTIONAL,                                                               -- Need ON
    sps-Configuration                   SPS-Configuration           OPTIONAL,       -- Need ON
    physicalConfigDedicated             PhysicalConfigDedicated     OPTIONAL,       -- Cond Misc
    ...
}

SRB-ToAddModifyList ::=             SEQUENCE (SIZE (1..2)) OF SEQUENCE {
    srb-Identity                        INTEGER (1..2),
    rlc-Configuration                   CHOICE {
        explicitValue                       RLC-Configuration,
        defaultValue                        NULL
    }       OPTIONAL,                                                           -- Cond Setup
    logicalChannelConfig                CHOICE {
        explicitValue                       LogicalChannelConfig,
        defaultValue                        NULL
    }       OPTIONAL,                                                           -- Cond Setup
    ...
}

DRB-ToAddModifyList ::=             SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE {
    eps-BearerIdentity                  INTEGER (0..15)         OPTIONAL,       -- Cond DRB-Setup
    drb-Identity                        INTEGER (1..32),
    pdcp-Configuration                  PDCP-Configuration      OPTIONAL,       -- Cond DRB-Setup
    rlc-Configuration                   RLC-Configuration       OPTIONAL,       -- Cond Setup
    logicalChannelIdentity              INTEGER (3..10)         OPTIONAL,       -- Cond DRB-Setup
    logicalChannelConfig                LogicalChannelConfig        OPTIONAL,   -- Cond Setup
    ...
}

DRB-ToReleaseList ::=               SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE {
    drb-Identity                        INTEGER (1..32)
}

-- ASN1STOP
```

***RadioResourceConfigDedicated* field descriptions**
rlc-Configuration SRB choice indicates whether the RLC configuration is set to the values signalled explicitly or to the values defined in the default RLC configuration for SRB1 in 9.2.1.1 or for SRB2 in 9.2.1.2. E-UTRAN does not reconfigure the RLC mode of DRBs.
pdcp-Configuration E-UTRAN can reconfigure PDCP header compression for DRBs only when the PDCP re-establishment procedure is performed.
mac-MainConfig The default MAC main configuration is specified in 9.2.2.
sps-Configuration The default SPS configuration is specified in 9.2.3.
physicalConfigDedicated The default dedicated physical configuration is specified in 9.2.4.
logicalChannelConfig [in SRB-ToAddModifyList] For SRBs a choice is used to indicate whether the logical channel configuration is signalled explicitly or set to the values defined in the default logical channel configuration for SRB1 in 9.2.1.1 or for SRB2 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 applicable.
Setup	The field is mandatory present if the corresponding SRB/DRB is being setup; otherwise the field is optionally present, continue.
Misc	The field is mandatory present upon connection establishment, handover within E-UTRA, handover to E-UTRA and connection re-establishment; otherwise the field is optionally present, continue.

– *RLC-Configuration*

The IE *RLC-Configuration* is used to specify the RLC configuration of SRBs and DRBs.

RLC-Configuration information element

```
-- ASN1START

RLC-Configuration ::=               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-Configuration* field descriptions**
sn-FieldLength Indicates the UM RLC SN field size in bits.
t-PollRetransmit Indicates the value of timer *T_poll_retransmit* [7] in milliseconds, ms5 means 5ms, ms10 means 10ms and so on.
pollPDU Indicates the value of constant *Poll_PDU* [7]. p4 corresponds to 4 PDUs, p8 to 8 PDUs and so on. pInfinity corresponds to infinite PDUs.
pollByte Indicates the value of constant *Poll_Byte* [7]. kB25 corresponds to 25 kBytes, kB50 to 50 kBytes and so on. kBInfinity corresponds to infinite kBytes.
maxRetxThreshold Indicates the value of the parameter Max_Retx_Threshold [7]. t1 corresponds to 1 retransmission, t2 to 2 retransmissions and so on.
t-Reordering Indicates the value of timer *T_reordering* [7] in milliseconds, ms0 means 0ms, ms5 means 5ms and so on.
t-StatusProhibit Indicates the value of timer *T_status_prohibit* [7] in milliseconds, ms0 means 0ms, ms5 means 5ms and so on.

– *SchedulingRequest-Configuration*

The IE *SchedulingRequest-Configuration* is used to specify the Scheduling Request related parameters

***SchedulingRequest-Configuration* information element**

```
-- ASN1START

SchedulingRequest-Configuration ::= CHOICE {
    disable                             NULL,
    enable                              SEQUENCE {
        sr-PUCCH-ResourceIndex              INTEGER (0..2047),
        sr-ConfigurationIndex               INTEGER (0..155),
        dsr-TransMax                        ENUMERATED {
                                                n4, n8, n16, n32, n64, spare3, spare2, spare1}
    }
}

-- ASN1STOP
```

***SchedulingRequest-Configuration* field descriptions**
sr-PUCCH-ResourceIndex Parameter: $n^{(1)}_{\text{PUCCH,SRI}}$. see TS 36.213 [23, 10.1].
sr-ConfigurationIndex Parameter I_{SR} . See TS 36.213 [23,10.1]
dsr-TransMax Parameter: *DSR_TRANS_MAX*, see TS 36.321 [6]. The value n4 corresponds to 4 transmissions, n8 corresponds to 8 transmissions and so on.

– *SoundingRsUl-Config*

The IE *SoundingRsUl-Config* is used to specify the uplink Sounding RS configuration.

***SoundingRsUl-Config* information element**

```
-- ASN1START

SoundingRsUl-ConfigCommon ::=           SEQUENCE {
    srsBandwidthConfiguration           ENUMERATED {bw0, bw1, bw2, bw3, bw4, bw5, bw6, bw7},
    srsSubframeConfiguration            ENUMERATED {
                                            sc0, sc1, sc2, sc3, sc4, sc5, sc6, sc7,
                                            sc8, sc9, sc10, sc11, sc12, sc13, sc14, sc15},
    ackNackSrsSimultaneousTransmission  BOOLEAN,
    srsMaxUpPts                         BOOLEAN
}

SoundingRsUl-ConfigDedicated ::=    CHOICE{
    disable                             NULL,
    enable                              SEQUENCE {
        srsBandwidth                        ENUMERATED {bw0, bw1, bw2, bw3},
        srsHoppingBandwidth                 ENUMERATED {hbw0, hbw1, hbw2, hbw3},
        frequencyDomainPosition             INTEGER (0..23),
        duration                            BOOLEAN,
        srs-ConfigurationIndex              INTEGER (0..1023),
        transmissionComb                    INTEGER (0..1),
        cyclicShift                         ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
    }
}


-- ASN1STOP
```

***SoundingRsUl-Config* field descriptions**
srsBandwidthConfiguration 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.
srsSubframeConfiguration Parameter: SRS SubframeConfiguration. See TS 36.211, 5.5.3.3. Table 5.5.3.3-1 applies for FDD whereas Table 5.5.3.3-2 applies for TDD. sc0 corresponds to value 0, sc1 to value 1 and so on.
srsAckNackSimultaneousTransmission Parameter: *Simultaneous-AN-and-SRS*, see TS 36.213 [23,, 8.2].
srsBandwidth Parameter: b, see TS 36.211 [21, 5.5.3.2: table 5.5.3.2-1].
frequencyDomainPosition Parameter: n_{RRC} , see TS 36.211 [21, 5.5.3.2]
frequencyHoppingInformation Parameter: Frequency-hopping. See TS 36.213, 8.2.
srsHoppingBandwidth 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, 8.2. FALSE corresponds to “single” and value TRUE to “indefinite”.
srs-ConfigurationIndex 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, 5.5.3.1 where cs0 corresponds to 0 etc.
srsMaxUpPts See TS 36.211 [21, 5.5.3.2] TDD only parameter: TRUE indicates reconfiguration of $m_{\mathrm{SRS},0}^{\max}$ in enabled for UpPts while FALSE indicates that reconfiguration is disabled.

– *SPS-Configuration*

The IE *SPS-Configuration* is used to specify the semi-persistent scheduling configuration.

***SPS-Configuration* information element**

```
-- ASN1START

SPS-Configuration ::=   SEQUENCE {
    semiPersistSchedC-RNTI          C-RNTI                  OPTIONAL,           -- need OD
    sps-ConfigurationDL             SPS-ConfigurationDL     OPTIONAL,           -- need ON
    sps-ConfigurationUL             SPS-ConfigurationUL     OPTIONAL            -- need ON
}

SPS-ConfigurationDL ::= CHOICE{
    disable                         NULL,
    enable                          SEQUENCE {
        semiPersistSchedIntervalDL          ENUMERATED {
                                                sf10, sf20, sf32, sf40, sf64, sf80,
                                                sf128, sf160, sf320, sf640, spare6,
                                                spare5, spare4, spare3, spare2,
                                                spare1},
        numberOfConfSPS-Processes           INTEGER (1..8),
        n1Pucch-AN-Persistent               INTEGER (0..2047),
        ...
    }
}

SPS-ConfigurationUL ::= CHOICE {
    disable                         NULL,
    enable                          SEQUENCE {
        semiPersistSchedIntervalUL          ENUMERATED {
                                                sf10, sf20, sf32, sf40, sf64, sf80,
                                                sf128, sf160, sf320, sf640, spare6,
                                                spare5, spare4, spare3, spare2,
                                                spare1},
        implicitReleaseAfter                ENUMERATED {e2, e3},
```

```
        p0-Persistent                       SEQUENCE {
            p0-NominalPUSCH-Persistent          INTEGER (-126..24),
            p0-UePUSCH-Persistent               INTEGER (-8..7)
        }       OPTIONAL,                                       -- need OP
        ...
    }
}

-- ASN1STOP
```

***SPS-Configuration* field descriptions**
semiPersistSchedC-RNTI Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].
semiPersistSchedIntervalDL Semi-persistent scheduling interval in downlink. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, this parameter should be round to the nearest integer (of 10 sub-frames) towards zero, 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 TS36.321 [6].
n1Pucch-AN-Persistent Parameter: $n_{PUCCH}^{(1)}$ see TS 36.213, [23, 10.1]
semiPersistSchedIntervalUL Semi-persistent scheduling interval in uplink. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, this parameter should be round to the nearest integer (of 10 sub-frames) towards zero, 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, 5.11.2. Value e2 corresponds to 2 transmissions, e3 corresponds to 3 transmissions.
p0-NominalPUSCH-Persistent Parameter: $P_{0,NOMINAL\_PUSCH}$ (0). See TS 36.213, 5.1.1.1, unit dBm step 1. This field is applicable for persistent scheduling, only. If choice 'enable' is used and *p0-Persistent* is absent, apply the (default) value of *p0-NominalPUSCH* for *p0-NominalPUSCH-Persistent.*
p0-UePUSCH-Persistent Parameter: $P_{0,UE;\ PUSCH}$ (0). See TS 36.213, 5.1.1.1, unit dB. This field is applicable for persistent scheduling, only. If choice 'enable' is used and *p0-Persistent* is absent, apply the (default) value of p0-UePUSCH for *p0-UePUSCH-Persistent.*

– *TDD-Configuration*

The IE *TDD-Configuration* is used to specify the TDD specific physical channel configuration.

***TDD-Configuration* information element**

```
-- ASN1START

TDD-Configuration ::=               SEQUENCE {
    subframeAssignment                  ENUMERATED {
                                            sa0, sa1, sa2, sa3, sa4, sa5, sa6},
    specialSubframePatterns             ENUMERATED {
                                            ssp0, ssp1, ssp2, ssp3, ssp4,ssp5, ssp6, ssp7,
                                            ssp8}
}

-- ASN1STOP
```

***TDD-Configuration* field descriptions**
subframeAssignment Indicates DL/UL subframe configuration where sa0 point to Configuration 0, sa1 to Configuration 1 etc. as specified in the 36.211, table 4.2.2.
specialSubframePatterns Indicates Configuration as in Ref 36.211, 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.

TimeAlignmentTimer information element

```
-- ASN1START

TimeAlignmentTimer ::=                  ENUMERATED {
                                                sf500, sf750, sf1280, sf1920, sf2560, sf5120,
                                                sf10240, infinity}
-- ASN1STOP
```

timeAlignmentTimer
Parameter: *Time Alignment Timer*, see 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.

– *TPC-Index*

The IE *TPC-Index* is used to indicate the index of N or M dependent on the used DCI format, i.e. DCI format 3 or DCI format 3A.

TPC-Index information element

```
-- ASN1START

TPC-Index ::=                           CHOICE {
    indexOfFormat3                          INTEGER (1..15),
    indexOfFormat3A                         INTEGER (1..31)
}

-- ASN1STOP
```

***TPC-Index* field descriptions**
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]

– *TPC-PDCCH-Configuration*

The IE *TPC-PDCCH-Configuration* 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 disabled or enabled with the IE.

TPC-PDCCH-Configuration information element

```
-- ASN1START

TPC-PDCCH-Configuration::=              CHOICE {
    disable             NULL,
    enable              SEQUENCE {
        tpc-RNTI                        BIT STRING (SIZE (16)),
        tpc-Index                       TPC-Index
    }
}

-- 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.

– *UL-ReferenceSignalsPUSCH*

The IE *UL-ReferenceSignalsPUSCH* is used to specify parameters needed for the transmission on PUSCH (or PUCCH).

UL-ReferenceSignalsPUSCH information element

```
-- ASN1START

UL-ReferenceSignalsPUSCH ::=        SEQUENCE {
    groupHoppingEnabled                 BOOLEAN,
    groupAssignmentPUSCH                INTEGER (0..29),
    sequenceHoppingEnabled              BOOLEAN,
    cyclicShift                         INTEGER (0..7)
}

-- ASN1STOP
```

UL-ReferenceSignalsPUSCH field descriptions
groupHoppingEnabled Parameter: *Group-hopping-enabled*, see TS 36.211 [21, 5.5.1.3].
groupAssignmentPUSCH Parameter: Δ_{SS} 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. $n_{\mathrm{DMRS}}^{(1)}$ See TS 36.211 [21, Table 5.5.2.1.1-2].

– *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-UePUSCH                              INTEGER (-8..7),
    deltaMCS-Enabled                        ENUMERATED {en0, en1},
    accumulationEnabled                     BOOLEAN,
    p0-uePUCCH                              INTEGER (-8..7),
    pSRS-Offset                             INTEGER (0..15)
}

DeltaFList-PUCCH ::=                    SEQUENCE {
    deltaF-PUCCH-Format1                ENUMERATED {deltaF-2, deltaF0, deltaF2, spare1},
    deltaF-PUCCH-Format1b               ENUMERATED {deltaF1, deltaF3, deltaF5, spare1},
    deltaF-PUCCH-Format2                ENUMERATED {deltaF-2, deltaF0, deltaF1, deltaF2},
    deltaF-PUCCH-Format2a               ENUMERATED {deltaF-2, deltaF0, deltaF2, spare1},
    deltaF-PUCCH-Format2b               ENUMERATED {deltaF-2, deltaF0, deltaF2, spare1}
}
```

```
-- ASN1STOP
```

***UplinkPowerControl* field descriptions**
p0-NominalPUSCH Parameter: $P_{0,NOMINAL\_PUSCH}$ See TS 36.213, 5.1.1.1, unit dBm step 1. 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: $P_{0,\ NOMINAL;\ PUCCH}$ See TS 36.213, 5.1.2.1, unit dBm
deltaF-PUCCH-FormatX Parameter: $\Delta_{\mathrm{F\_PUCCH}}(F)$ 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-UePUSCH Parameter: $P_{0,UE;\ PUSCH}$ See TS 36.213, 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, 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-UePUCCH Parameter: $P_{0,UE;\ PUCCH}$ See TS 36.213, 5.1.2.1.
pSRS-Offset Parameter: P_{SRS_OFFSET} See TS 36.213, 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.

6.3.3 Security control information elements

– *CipheringAlgorithm*

The IE *CipheringAlgorithm* is used to indicate the algorithm to be used for ciphering the SRBs and DRBs.

***CipheringAlgorithm* information element**

```
-- ASN1START

CipheringAlgorithm ::=              ENUMERATED {
                                        eea0, eea1, eea2, spare5, spare4, spare3,
                                        spare2, spare1, ...}

-- ASN1STOP
```

***CipheringAlgorithm* field descriptions**
%fieldIdentifier%

– *IntegrityProtAlgorithm*

The IE *IntegrityProtAlgorithm* is used to indicate the algorithm to be used for integrity protection of the SRBs..

***IntegrityProtAlgorithm* information element**

```
-- ASN1START

IntegrityProtAlgorithm ::=          ENUMERATED {
                                        eia1, eia2, spare6, spare5, spare4, spare3,
```

```
                                        spare2, spare1, ...}

-- ASN1STOP
```

***IntegrityProtAlgorithm* field descriptions**
%fieldIdentifier%

– *NextHopChainingCount*

The IE NextHopChainingCount is used to update the K_{eNB} key at handover.

***NextHopChainingCount* information element**

```
-- ASN1START

NextHopChainingCount ::=                    INTEGER (0..3)

-- ASN1STOP
```

***NextHopChainingCount* field descriptions**
Parameter NCC: See TS 33.401 [32, 7.2.8.4]

– *SecurityConfiguration*

The IE *SecurityConfiguration* is used to configure AS integrity protection (CP) and AS ciphering (CP and UP).

***SecurityConfiguration* information element**

```
-- ASN1START

SecurityConfiguration ::=           SEQUENCE {
    integrityProtAlgorithm              IntegrityProtAlgorithm          OPTIONAL,   -- Cond SMC
    cipheringAlgorithm                  CipheringAlgorithm              OPTIONAL,   -- Cond SMC
    keyChangeIndicator                  BOOLEAN,
    nextHopChainingCount                NextHopChainingCount,
    ...
}

-- ASN1STOP
```

***SecurityConfiguration* field descriptions**
integrityProtAlgorithm Indicates which integrity protection algorithm to use for SRBs
cipheringAlgorithm The same ciphering algorithm is assumed to be used for SRBs and DRBs
keyChangeIndicator Indicates whether the UE shall derive the K_{eNB} key associated with latest available K_{ASME} or the K_{ASME} key to which the current K_{eNB} is associated.
nextHopChainingCount Parameter NCC: See TS 33.401 [32, 7.2.8.4]

Conditional presence	Explanation
SMC	The field is mandatory present if the IE *SecurityConfiguration* is included in the *SecurityModeCommand* message; otherwise the field is optional, continue.

– *ShortMAC-I*

The IE *ShortMAC-I* is used to identify and verify the UE at RRC connection re-establishment.

***ShortMAC-I* information element**

```
-- ASN1START

ShortMAC-I ::=                      BIT STRING (SIZE (16))

-- ASN1STOP
```

***ShortMAC-I* field descriptions**
ShortMAC-I 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.

6.3.4 Mobility control information elements

– *CDMA2000-Bandclass*

The IE *CDMA2000-Bandclass* used to define the CDMA2000 band classes as defined in table 1.5-1 of [24].

***CDMA2000-Bandclass* information element**

```
-- ASN1START

CDMA2000-Bandclass ::=                  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
```

– *CDMA2000-CarrierInfo*

The IE *CDMA2000-CarrierInfo* used to provide the CDMA2000 carrier information.

***CDMA2000-CarrierInfo* information element**

```
-- ASN1START

CDMA2000-CarrierInfo ::=            SEQUENCE {
    bandClass                           CDMA2000-Bandclass,
    frequency                           INTEGER (0..2047)
}

-- ASN1STOP
```

***CDMA2000-CarrierInfo* field descriptions**
bandClass Identifies the CDMA2000 Frequency Band in which the CDMA2000 Carrier can be found, see [24].
frequency Identifies the carrier frequency within a CDMA2000 Band, see [33].

– *CDMA2000-CellIdentity*

The IE *CDMA2000-CellIdentity* identifies the PNOffset that represents the "Physical cell identity" in CDMA2000.

***CDMA2000-CellIdentity* information element**

```
-- ASN1START

CDMA2000-CellIdentity ::=           INTEGER (0..maxPNOffset)
```

```
-- ASN1STOP
```

***CDMA2000-CellIdentity* field descriptions**
Void

– *CDMA2000-DedicatedInfo*

The *CDMA2000-DedicatedInfo* is used to transfer UE specific CDMA2000 information between the network and the UE. The RRC layer is transparent for this information.

CDMA2000-DedicatedInfo information element

```
-- ASN1START

CDMA2000-DedicatedInfo ::=              OCTET STRING

-- ASN1STOP
```

***CDMA2000-DedicatedInfo* field descriptions**
Void

– *CDMA2000-MobilityParameters*

The *CDMA2000-MobilityParameters* contains the parameters provided to the UE for SRVCC support. These parameters are defined by 3GPP2 in [ref].

CDMA2000-MobilityParameters information element

```
-- ASN1START

CDMA2000-MobilityParameters ::=         OCTET STRING

-- ASN1STOP
```

***CDMA2000-MobilityParameters* field descriptions**
Void

– *CDMA2000-NeighbourCellInformation*

The IE *CDMA2000-NeighbourCellInformation* is used to describe a CDMA2000 1xRTT or a CDMA2000 HRPD neighboring cell.

CDMA2000-NeighbourCellInformation information element

```
-- ASN1START

CDMA2000-NeighbourCellInformation ::= SEQUENCE {
    cdma2000-CarrierInfo                CDMA2000-CarrierInfo,
    pnOffset                            CDMA2000-CellIdentity
}

-- ASN1STOP
```

CDMA2000-NeighborCellInformation field descriptions
CDMA2000-CarrierInfo Indicates frequency and band class of the cell.
pnOffset Identifies the CDMA "Physical cell identity".

– *CDMA2000-RAND*

The *CDMA2000-RAND* concerns a random value for 1xRTT, generated by the eNB, to be passed to the CDMA2000 upper layers.

CDMA2000-RAND information element

```
-- ASN1START

CDMA2000-RAND ::=                       BIT STRING (SIZE (32))

-- ASN1STOP
```

CDMA2000-RAND field descriptions
Void

– *CDMA2000-SystemTimeInfo*

The IE CDMA2000-SystemTimeInfo 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 CDMA system time with a certain level of accuracy for performing measurements as well as for communicating with the CDMA network (HRPD or 1xRTT).

CDMA2000-SystemTimeInfo information element

```
-- ASN1START

CDMA2000-SystemTimeInfo ::=         SEQUENCE {
    cdma-EUTRA-Synchronisation          BOOLEAN,
    cdma-SystemTime                     CHOICE {
        cdma-SynchronousSystemTime          BIT STRING (SIZE (39)),
        cdma-AsynchronousSystemTime         BIT STRING (SIZE (49))
    }
}

-- ASN1STOP
```

CDMA2000-SystemTimeInfo 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 CDMA. FALSE indicates that the networks are not synchronised, i.e. the timing between E-UTRA and CDMA can drift.
cdma-SynchronousSystemTime CDMA 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 CDMA system time then the size is 39 bits and the unit is 10 ms based on a 1.2288 Mcps chip rate.
cdma-AsynchronousSystemTime The CDMA 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 CDMA chips based on 1.2288 Mcps].

– *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
```

CDMA2000-Type field descriptions
cdma2000-Type Type of CDMA2000 network: 1xRTT or HRPD.

– *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 SEQUENCE {
    cellIndex                               INTEGER (1..maxCellMeas)
}

-- ASN1STOP
```

– *ConnectedModeSpeedDependentScalingParameters*

The IE *ConnectedModeSpeedDependentScalingParameters* contains scaling factors according to mobility states in active mode.

ConnectedModeSpeedDependentScalingParameters information element

```
-- ASN1START

ConnectedModeSpeedDependentScalingParameters ::= SEQUENCE {
    timeToTriggerSF-Medium                          ENUMERATED {oDot25, oDot5, oDot75, lDot0},
    timeToTriggerSF-High                            ENUMERATED {oDot25, oDot5, oDot75, lDot0}
}

-- ASN1STOP
```

***ConnectedModeSpeedDependentScalingParameters* field descriptions**
timeToTriggerSF-Medium The IEs *timeToTrigger* in *ReportConfigEUTRA* and *ReportConfigInterRAT* is multiplied with this factor if the UE is in Medium Mobility state. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.
timeToTriggerSF-High The IEs *timeToTrigger* in *ReportConfigEUTRA* and *ReportConfigInterRAT* is multiplied with this factor if the UE is in High Mobility state. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5 , oDot75 corresponds to 0.75 and so on.

– *EUTRA-CarrierFreq*

The IE *EUTRA-CarrierFreq* is used %%

EUTRA-CarrierFreq information element

```
-- ASN1START

EUTRA-CarrierFreq ::=               SEQUENCE {
    earfcn-DL                           INTEGER (0..maxEARFCN),
    earfcn-UL                           EUTRA-DL-CarrierFreq                OPTIONAL    -- Cond FDD
}

-- ASN1STOP
```

***EUTRA-CarrierFreq* field descriptions**
earfcn-DL Defined in [36.101]
earfcn-UL Default value determined from TX-RX frequency specification specified in [36.101]

Conditional presence	Explanation
FDD	The field is mandatory with default value (default duplex distance defined for the concerned band) in case of “FDD”; otherwise the field is not applicable.

– *EUTRA-DL-CarrierFreq*

The IE EUTRA-DL-CarrierFreq is used %%

EUTRA-DL-CarrierFreq information element

```
-- ASN1START

EUTRA-DL-CarrierFreq ::=                INTEGER (0..maxEARFCN)

-- ASN1STOP
```

***EUTRA-DL-CarrierFreq* field descriptions**
EUTRA-DL-CarrierFreq The EARFCN used in downlink, as defined in [36.101]

– *GERAN-ARFCN-Value*

The IE *GERAN-ARFCN-Value* is used to specify a GERAN BCCH carrier frequency.

GERAN-ARFCN-Value information element

```
-- ASN1START

GERAN-ARFCN-Value ::=           INTEGER (0..1023)
```

```
-- ASN1STOP
```

***GERAN-ARFCN-Value* field descriptions**
GERAN-ARFCN-Value
Range of GERAN carrier frequencies.

– *GERAN-BandIndicator*

The IE *GERAN-BandIndicator* is used as an indication of how to interpret an associated GERAN carrier ARFCN.

GERAN-BandIndicator information element

```
-- ASN1START

GERAN-BandIndicator ::=         ENUMERATED {dcs1800, pcs1900}

-- ASN1STOP
```

***GERAN-BandIndicator* field descriptions**
GERAN-BandIndicator
Indicator to distinguish the GERAN frequency band in case of ARFCN values associated with either DCS 1800 or PCS 1900 carriers. For ARFCN values not associated with one of those bands, the indicator has no meaning.

– *GERAN-CarrierFreq*

The IE *GERAN-CarrierFreq* is used to provide an unambiguous carrier frequency description of a GERAN cell.

GERAN-CarrierFreq information element

```
-- ASN1START

GERAN-CarrierFreq ::=           SEQUENCE {
    arfcn                           GERAN-ARFCN-Value,
    bandIndicator                   GERAN-BandIndicator
}

-- ASN1STOP
```

***GERAN-CarrierFreq* field descriptions**
arfcn
GERAN ARFCN of BCCH carrier
bandIndicator
Indicates how to interpret the ARFCN of the BCCH carrier

– *GERAN-CarrierFreqList*

The IE *GERAN-CarrierFreqList* is used to provide a set of GERAN ARFCN values [44.005], which represents a list of GERAN frequencies.

GERAN-CarrierFreqList information element

```
-- ASN1START

GERAN-CarrierFreqList ::=       SEQUENCE {
    startingARFCN                       GERAN-ARFCN-Value,
    bandIndicator                       GERAN-BandIndicator,
    followingARFCNs                     CHOICE {
        explicitListOfARFCNs                ExplicitListOfARFCNs,
        equallySpacedARFCNs                 SEQUENCE {
            arfcn-Spacing                       INTEGER (1..8),
            numberOfFollowingARFCNs             INTEGER (0..31)
        },
```

```
        variableBitMapOfARFCNs              OCTET STRING (SIZE (1..16))
        -- Other options, e.g., the "Range N formats" in the Frequency List IE [44.018] are FFS
    }
}

ExplicitListOfARFCNs ::=            SEQUENCE (SIZE (0..31)) OF GERAN-ARFCN-Value

-- ASN1STOP
```

***GERAN-CarrierFreqList* 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".

– *GERAN-CellIdentity*

The IE *GERAN-CellIdentity* contains the Base Station Identity Code (BSIC) and is used %%

GERAN-CellIdentity information element

```
-- ASN1START

GERAN-CellIdentity ::=              SEQUENCE {
    networkColourCode                   BIT STRING (SIZE (3)),
    baseStationColourCode               BIT STRING (SIZE (3))
}

-- ASN1STOP
```

***GERAN-CellIdentity* 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].

– *GlobalCellId-EUTRA*

The IE *GlobalCellId-EUTRA* specifies the Evolved Cell Global Identifier (ECGI), the globally unique identity of a cell in E-UTRA.

GlobalCellId-EUTRA information element

```
-- ASN1START

GlobalCellId-EUTRA ::=                  SEQUENCE {
    plmn-Identity                           PLMN-Identity,
    cellIdentity                            CellIdentity
}
```

```
-- ASN1STOP
```

GlobalCellId-EUTRA 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.

– *GlobalCellId-UTRA*

The IE *GlobalCellId-UTRA* specifies the global UTRAN Cell Identifier, the globally unique identity of a cell in UTRA.

GlobalCellId-UTRA information element

```
-- ASN1START

GlobalCellId-UTRA ::=                   SEQUENCE {
    plmn-Identity                           PLMN-Identity,
    utra-CellIdentity                       BIT STRING (SIZE (28))
}

-- ASN1STOP
```

GlobalCellId-UTRA 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.

– *GlobalCellId-GERAN*

The IE *GlobalCellId-GERAN* specifies the Cell Global Identification (CGI), the globally unique identity of a cell in GERAN.

GlobalCellId-GERAN information element

```
-- ASN1START

GlobalCellId-GERAN ::=                  SEQUENCE {
    plmn-Identity                           PLMN-Identity,
    locationAreaCode                        BIT STRING (SIZE (16)),
    geran-CellIdentity                      BIT STRING (SIZE (16))
}

-- ASN1STOP
```

GlobalCellId-GERAN 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].
geran-CellIdentity
Cell Identifier which is unique within the context of the GERAN location area as defined in TS 23.003 [27].

– *GlobalCellId-CDMA2000*

The IE *GlobalCellId-CDMA2000* specifies the Cell Global Identification (CGI), the globally unique identity of a cell in CDMA2000.

***GlobalCellId-CDMA2000* information element**

```
-- ASN1START

GlobalCellId-CDMA2000 ::=               CHOICE {
    globalCellId-oneXRTT                    BIT STRING (SIZE (47)),
    globalCellId-HRPD                       BIT STRING (SIZE (128))
}

-- ASN1STOP
```

GlobalCellId-CDMA2000 field descriptions
globalCellId-oneXRTT
Unique identifier for a 1xRTT cell, corresponds to BASEID, SID and NID parameters (in that order) defined in [25]
globalCellId-HRPD
Unique identifier for a HRPD cell, corresponds to SECTOR ID parameter defined in [26] clause 14.9.

– *HRPD-PreRegistrationInfo*

```
-- ASN1START

HRPD-PreRegistrationInfo ::=            SEQUENCE {
    hrpd-PreRegistrationAllowed             BOOLEAN,
    hrpd-PreRegistrationZoneId              INTEGER (0..255)    OPTIONAL,   -- cond PreRegAllowed
    hrpd-SecondaryPreRegistrationZoneIdList HRPD-SecondaryPreRegistrationZoneIdList OPTIONAL    --
Need OD
}

HRPD-SecondaryPreRegistrationZoneIdList ::= SEQUENCE (SIZE (1..2)) OF SEQUENCE {
    hrpd-SecondaryPreRegistrationZoneId     INTEGER (0..255)
}

-- ASN1STOP
```

***HRPD-PreRegistrationInfo* field descriptions**
HRPD-PreRegistrationAllowed
TRUE indicates that a UE shall perform an HRPD pre-registration if the UE does not have a valid / current pre-registration. FALSE indicates that the UE is not allowed to perform HRPD pre-registration in the current cell.
HRPD-PreRegistrationZoneID
Used to control when the UE should re-register.
HRPD-SecondaryPreRegistrationZoneIdList
Used to control when the UE should re-register.

Conditional presence	Explanation
PreRegAllowed	The field is mandatory in case the *hrpd-PreRegistrationAllowed* is set to 'true'. Otherwise the field is not applicable

– *MobilityControlInformation*

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

***MobilityControlInformation* information element**

```
-- ASN1START

MobilityControlInformation ::=      SEQUENCE {
    targetCellIdentity                  PhysicalCellIdentity,
    eutra-CarrierFreq                   EUTRA-CarrierFreq                   OPTIONAL,   -- Need OP
    eutra-CarrierBandwidth              EUTRA-CarrierBandwidth              OPTIONAL,   -- Need ON
    additionalSpectrumEmission          INTEGER (0..31)                     OPTIONAL,   -- Need ON
    p-Max                               P-Max                               OPTIONAL,   -- Need OP
    t304                                ENUMERATED {
                                            ms50, ms100, ms150, ms200, ms500, ms1000,
                                            ms2000, spare1},
    newUE-Identity                      C-RNTI,
    radioResourceConfigCommon           RadioResourceConfigCommon,
```

```
    rach-ConfigDedicated                RACH-ConfigDedicated                OPTIONAL,   -- Need OP
    ...
}

EUTRA-CarrierBandwidth ::=          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
}

-- ASN1STOP
```

***MobilityControlInformation* field descriptions**
additionalSpectrumEmission Defined in [36.101]
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* [36.101]. If absent, i.e. if eutra-CarrierBandwidth is absent, apply the same downlink bandwidth as for the current cell.
ul-Bandwidth Parameter: *Uplink bandwidth* [36.101]. For TDD, the parameter is absent and it is equal to downlink bandwidth. If absent for FDD (includes the case eutra-CarrierBandwidth is absent), apply the same uplink bandwidth as for the current cell.
p-Max Pmax to be used in the target cell. If absent the UE applies the maximum power according to the UE capability.
rach-ConfigDedicated The dedicated random access parameters. If absent the UE applies contention based random access as specified in TS 36.321 [6].
eutra-CarrierBandwidth Provides the parameters *Downlink bandwidth*, and *Uplink bandwidth* [36.101]. When this field is not included, the values as captured in the case of absence of the individual fields applies.

– *MobilityStateParameters*

The IE *MobilityStateParameters* contains parameters to determine UE mobility state.

***MobilityStateParameters* information element**

```
-- ASN1START

MobilityStateParameters ::=         SEQUENCE {
    t-Evalulation                       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-Evalulation The duration for evaluating criteria to enter mobility states. Corresponds to T_{CRmax} in TS 36.304 [4]. 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]. 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].

– *OneXRTT-CSFB-RegistrationInfo*

```
-- ASN1START

OneXRTT-CSFB-RegistrationInfo ::=   SEQUENCE {
    oneXRTT-CSFB-RegistrationAllowed    BOOLEAN,
    oneXRTT-RegistrationParameters      OneXRTT-RegistrationParameters OPTIONAL -- cond CSFB-RegAlw
}

-- ASN1STOP
```

OneXRTT-CSFB-RegistrationInfo field descriptions
onexrtt-CSFBRegistrationAllowed TRUE indicates that a UE in LTE_IDLE shall perform an 1xRTT pre-registration if the UE does not have a valid / current pre-registration. FALSE indicates that UE in LTE_IDLE is not allowed to perform a 1xRTT pre-registration.
Onexrtt-RegistrationParameters Contains the parameters the handset will use to determine if it should perform a 1xRTT Registration/Re-Registration.

Conditional presence	Explanation
CSFB-RegAlw	**The field is mandatory in case the *oneXRTTt-CSFB-RegistrationAllowed* is set to '*TRUE*'. The field is not applicable otherwise**

– OneXRTT-RegistrationParameters

```
-- ASN1START

OneXRTT-RegistrationParameters ::=      SEQUENCE {
    oneXRTT-SID                 BIT STRING (SIZE (15)),
    oneXRTT-NID                 BIT STRING (SIZE (16)),
    oneXRTT-MultipleSID         BOOLEAN,
    oneXRTT-MultipleNID         BOOLEAN,
    oneXRTT-HomeReg             BOOLEAN,
    oneXRTT-ForeignSIDReg       BOOLEAN,
    oneXRTT-ForeignNIDReg       BOOLEAN,
    oneXRTT-ParameterReg        BOOLEAN,
    oneXRTT-RegistrationPeriod  BIT STRING (SIZE (7)),
    oneXRTT-RegistrationZone    BIT STRING (SIZE (12)),
    oneXRTT-TotalZone           BIT STRING (SIZE (3)),
    oneXRTT-ZoneTimer           BIT STRING (SIZE (3))
}

-- ASN1STOP
```

ONEXRTT-RegistrationParameters field descriptions
oneXRTT-SID Used along with the oneXRTT-NetworkID as a pair to control when the UE should Re-Register with the 1xRTT network.
oneXRTT-NID Used along with the oneXRTT-SystemID as a pair to control when the UE should Re-Register with the 1xRTT network.
oneXRTT-MultipleSID The 1xRTT Multiple SID storage indicator.
oneXRTT-MultipleNID The 1xRTT Multiple NID storage indicator.
oneXRTT-HomeReg The 1xRTT Home registration indicator.
oneXRTT-ForeignSIDReg The 1xRTT SID roamer registration indicator.
oneXRTT-ForeignNIDReg The 1xRTT NID roamer registration indicator.
oneXRTT-ParameterReg The 1xRTT Parameter-change registration indicator.
oneXRTT-RegistrationPeriod The 1xRTT Registration period.
oneXRTT-RegistrationZone The 1xRTT Registration zone.
oneXRTT-TotalZone The 1xRTT Number of registration zones to be retained.
oneXRTT-ZoneTimer The 1xRTT Zone timer length.

– *PhysicalCellIdentity*

The IE PhysicalCellIdentity is used %%

PhysicalCellIdentity information element

```
-- ASN1START

PhysicalCellIdentity ::=            INTEGER (0..503)

-- ASN1STOP
```

***PhysicalCellIdentity* field descriptions**
Void

– *PhysicalCellIdentityAndRange*

The IE *PhysicalCellIdentityAndRange* is used to encode either a single or a range of physical cell identities. The range is encoded by using a *startPCI* value and by indicating the number of consecutive PCIs (including *startPCI*) in the range.

PhysicalCellIdentityAndRange information element

```
-- ASN1START

PhysicalCellIdentityAndRange ::=    CHOICE {
    singlePCI                           PhysicalCellIdentity,
    rangeOfPCI                          SEQUENCE {
        startPCI                            PhysicalCellIdentity,
        rangePCI                            ENUMERATED {
                                                n5, n10, n15, n20, n25, n30, n40, n50, n64,
                                                n84, n100, n168, n252, spare3, spare2, spare1}
    }
}

-- ASN1STOP
```

***PhysicalCellIdentityAndRange* field descriptions**
startPCI Indicates the lowest PCI in the range
rangePCI Indicates the number of PCIs in the range (including *startPCI*). Value n5 corresponds with 5, n10 corresponds with 10 and so on. Note: The need of value 504 for this field is FFS.

– *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
mnc The first element contains the first MNC digit, the second element the second MNC digit and so on

Conditional presence	Explanation
MCC	In the first occurrence of the IE *PLMN-Identity* within the IE *PLMN-IdentityList* this IE is mandatory; otherwise it is optional and if not present it takes the same value as the mcc in the immediately preceding IE *PLMN-Identity*.This IE is mandatory when the IE *PLMN-Identity* is included within the IE *RegisteredMME*.

– *ReselectionThreshold*

The IE *ReselectionThreshold* is used to indicate a threshold for cell reselection.

ReselectionThreshold information element

```
-- ASN1START

ReselectionThreshold ::=                INTEGER (0..31)

-- ASN1STOP
```

***ReselectionThreshold* field descriptions**
ReselectionThreshold Actual value of threshold in dB = IE value * 2.

– *TrackingAreaCode*

The IE TrackingAreaCode is %%

TrackingAreaCode information element

```
-- ASN1START

TrackingAreaCode ::=                BIT STRING (SIZE (16))

-- ASN1STOP
```

***TrackingAreaCode* field descriptions**
%fieldIdentifier%

– *UTRA-FDD-CellIdentity*

The IE UTRA-FDD-CellIdentity is %%

UTRA-FDD-CellIdentity information element

```
-- ASN1START

UTRA-FDD-CellIdentity ::=           SEQUENCE {
    primaryScramblingCode           INTEGER (0..511)
}

-- ASN1STOP
```

***UTRA-FDD-CellIdentity* field descriptions**
primaryScramblingCode Primary scrambling code of the UTRA FDD cell, which corresponding to the Primary scrambling code in TS 25.331 [19].

– *UTRA-TDD-CellIdentity*

The IE UTRA-TDD-CellIdentity is the physical layer (L1) identity of a UTRA cell (TDD).

UTRA-TDD-CellIdentity information element

```
-- ASN1START

UTRA-TDD-CellIdentity ::=           SEQUENCE {
    cellParametersID                    INTEGER (0..127)
}

-- ASN1STOP
```

***UTRA-TDD-CellIdentity* field descriptions**
cellParametersID Corresponds to the Cell Parameters ID in TS 25.331 [19] and the Initial Cell Parameter Assignment in TS 25.223.

– *UTRA-DL-CarrierFreq*

The IE *UTRA-CarrierFreq* is used %%

UTRA-DL-CarrierFreq information element

```
-- ASN1START
```

```
UTRA-DL-CarrierFreq ::=             SEQUENCE {
    uarfcn-DL                           INTEGER (0..16383)
}

-- ASN1STOP
```

***UTRA-DL-CarrierFreq* field descriptions**
uarfcn-DL
For UTRA FDD: the field contains the downlink frequency (Nd)
For UTRA TDD: the field contains the (Nt)

6.3.5 Measurement information elements

– *MeasGapConfig*

The IE *MeasGapConfig* specifies the measurement gap configuration and controls activation/ deactivation of measurement gaps.

MeasGapConfig information element

```
-- ASN1START

MeasGapConfig ::=                   SEQUENCE {
    gapActivation                       CHOICE {
        activate                            SEQUENCE {
            gapPattern                          CHOICE {
                gp1                                 SEQUENCE {
                    gapOffset                           INTEGER (0..39)
                },
                gp2                                 SEQUENCE {
                    gapOffset                           INTEGER (0..79)
                },
                ...
            }
        },
        deactivate                          NULL
    }
}

-- ASN1STOP
```

***MeasGapConfig* field descriptions**
gapActivation
Used to activate/ deactivate the measurement gap pattern.
gapPattern
Reference to a measurement gap pattern defined in TS 36.133 [16]. Value *gapOffset* of *gp1* corresponds to gap offset of Gap Pattern Id “0” with TGRP = 40ms, *gapOffset* of *gp2* corresponds to gap offset of Gap Pattern Id “1” with TGRP = 80ms.

– *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
```

***MeasId* field descriptions**
Void

– *MeasObjectCDMA2000*

The IE *MeasObjectCDMA2000* specifies information applicable for inter-RAT CDMA2000 neighbouring cells.

***MeasObjectCDMA2000* information element**

```
-- ASN1START

MeasObjectCDMA2000 ::=              SEQUENCE {
    cdma2000-Type                       CDMA2000-Type,
    cdma2000-CarrierInfo                CDMA2000-CarrierInfo,
    cdma2000-SearchWindowSize           INTEGER (0..15)                     OPTIONAL,   -- Need ON
    offsetFreq                          ENUMERATED {
                                            db-15, dB-14, db-13, dB-12, dB-11, dB-10, db-9,
                                            dB-8, dB-7, dB-6, dB-5, dB-4, dB-3, dB-2, dB-1, dB0,
                                            dB1, dB2, dB3, dB4, dB5, dB6, db7, dB8, dB9, dB10,
                                            dB11, dB12, dB13, dB14, dB15, spare}        DEFAULT dB0,
    cellsToRemoveList                   CellIndexList                       OPTIONAL,   -- Need ON
    cellsToAddModifyList                CDMA2000-CellsToAddModifyList       OPTIONAL,   -- Need ON
    cellForWhichToReportCGI             CDMA2000-CellIdentity               OPTIONAL,   -- Need ON
    ...
}

CDMA2000-CellsToAddModifyList ::=   SEQUENCE (SIZE (1..maxCellMeas)) OF SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),
    cellIdentity                        CDMA2000-CellIdentity
}

-- ASN1STOP
```

***MeasObjectCDMA2000* field descriptions**
cdma2000-Type The type of CDMA2000 network: 1xRTT or HRPD.
cdma2000-CarrierInfo Identifies CDMA2000 carrier frequency for which this configuration is valid.
cdma2000-SearchWindowSize Provides the search window size to be used by the UE for the neighbouring pilot, see [25].
offsetFreq Offset value applicable to the carrier frequency. Value dB-15 corresponds to -15 dB, dB-14 corresponds to -14 dB and so on.
cellsToRemoveList List of cells to remove from the neighbouring cell list.
cellsToAddModifyList List of cells to add/ modify in the neighbouring cell list.
cellIndex Entry index in the neighbouring cell list.
cellIdentity CDMA2000 Physical cell identity of a cell in neighbouring cell list expressed as PNOffset.

– *MeasObjectEUTRA*

The IE *MeasObjectEUTRA* specifies information applicable for intra-frequency or inter-frequency E-UTRA neighbouring cells.

***MeasObjectEUTRA* information element**

```
-- ASN1START

MeasObjectEUTRA ::=                 SEQUENCE {
    eutra-CarrierInfo                   EUTRA-DL-CarrierFreq,
    measurementBandwidth                MeasurementBandwidth,
    offsetFreq                          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, spare}    DEFAULT dB0,
    -- Neighbour cell list
    cellsToRemoveList                   CellIndexList               OPTIONAL,       -- Need ON
    cellsToAddModifyList                NeighCellsToAddModifyList   OPTIONAL,       -- Need ON
    -- Black list
    blackListedCellsToRemoveList        CellIndexList   OPTIONAL,                   -- Need ON
    blackListedCellsToAddModifyList     BlackListedCellsToAddModifyList OPTIONAL,   -- Need ON
    cellForWhichToReportCGI             PhysicalCellIdentity            OPTIONAL,   -- Need ON
    ...
}

NeighCellsToAddModifyList ::=       SEQUENCE (SIZE (1..maxCellMeas)) OF SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),
    cellIdentity                        PhysicalCellIdentity,
    cellIndividualOffset                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, spare}
}

BlackListedCellsToAddModifyList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),               -- value range FFS
    cellIdentityAndRange                PhysicalCellIdentityAndRange
}

-- ASN1STOP
```

***MeasObjectEUTRA* field descriptions**
eutra-CarrierInfo Identifies E-UTRA carrier frequency for which this configuration is valid.
measurementBandwidth Measurement bandwidth common for all neighbouring cells on the frequency.
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.
cellsToAddModifyList List of cells to add/ modify in the neighbouring cell list. If *eutra-CarrierInfo* identifies the E-UTRA carrier frequency of the serving cell and measurement event A3 is configured the list shall include the serving cell.
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.
cellIdentity 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.
blackListedCellsToRemoveList List of cells to remove from the black list of cells.
blackListedCellsToAddModifyList List of cells to add/ modify in the black list of cells.
cellIdentityAndRange 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 {
```

```
    geran-MeasFrequencyList             GERAN-MeasFrequencyList,
    offsetFreq                          INTEGER (-15..15)           DEFAULT 0,  -- value range FFS
    ncc-Permitted                       BIT STRING(SIZE (8))        DEFAULT '11111111'B,
    cellForWhichToReportCGI             GERAN-CellIdentity          OPTIONAL,   -- Need ON
    ...
}

GERAN-MeasFrequencyList ::=         SEQUENCE (SIZE (1..maxGNFG)) OF GERAN-CarrierFreqList

-- ASN1STOP
```

***MeasObjectGERAN* field descriptions**
geran-MeasFrequencyList Provides a list of neighbouring GERAN carrier frequencies defining the measurement object.
offsetFreq Offset value applicable to the GERAN carrier frequencies. Value in dB.
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
```

***MeasObjectId* field descriptions**
Void

– *MeasObjectUTRA*

The IE *MeasObjectUTRA* specifies information applicable for inter-RAT UTRA neighbouring cells.

Editor's note: Use of cell individual offset is FFS.

MeasObjectUTRA information element

```
-- ASN1START

MeasObjectUTRA ::=                  SEQUENCE {
    utra-CarrierFreq                    UTRA-DL-CarrierFreq,
    offsetFreq                          INTEGER (-15..15)           DEFAULT 0,  -- value range FFS
    cellsToRemoveList                   CellIndexList               OPTIONAL,           -- Need ON
    cellsToAddModifyList                CHOICE {
        cellsToAddModifyListUTRA-FDD        UTRA-FDD-CellsToAddModifyList,
        cellsToAddModifyListUTRA-TDD        UTRA-TDD-CellsToAddModifyList
    }                                                               OPTIONAL,           -- Need ON
    cellForWhichToReportCGI             CHOICE {
        utra-FDD                            UTRA-FDD-CellIdentity,
        utra-TDD                            UTRA-TDD-CellIdentity
    }                                                               OPTIONAL,   -- Need ON
    ...
}

UTRA-FDD-CellsToAddModifyList ::=   SEQUENCE (SIZE (1..maxCellMeas)) OF SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),                       -- FFS
    utra-FDD-CellIdentity               UTRA-FDD-CellIdentity
}
```

```
UTRA-TDD-CellsToAddModifyList ::=   SEQUENCE (SIZE (1..maxCellMeas)) OF SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),                       -- FFS
    utra-TDD-CellIdentity               UTRA-TDD-CellIdentity
}

-- ASN1STOP
```

***MeasObjectUTRA* field descriptions**
utra-CarrierFreq Identifies UTRA carrier frequency for which this configuration is valid.
offsetFreq Offset value applicable to the UTRA carrier frequency. Value in dB.
cellsToRemoveList List of cells to remove from the neighbouring cell list.
cellsToAddModifyListUTRA-FDD List of UTRA FDD cells to add/ modify in the neighbouring cell list.
cellsToAddModifyListUTRA-TDD List of UTRA TDD cells to add/modify in the neighbouring cell list.
cellIndex Entry index in the neighbouring cell list.

– *MeasuredResults*

The IE *MeasuredResults* covers measured results for intra-frequency, inter-frequency and inter- RAT mobility.

Editor's note: It has been agreed to identify intra- and inter-frequency neighbours by their physical layer identity

***MeasuredResults* information element**

```
-- ASN1START

MeasuredResults ::=                 SEQUENCE {
    measId                              MeasId,
    measResultServing                   SEQUENCE {
        rsrpResult                          RSRP-Range,
        rsrqResult                          RSRQ-Range
    },
    neighbouringMeasResults             CHOICE {
        measResultListEUTRA                 MeasResultListEUTRA,
        measResultListUTRA                  MeasResultListUTRA,
        measResultListGERAN                 MeasResultListGERAN,
        measResultsCDMA2000                 MeasResultsCDMA2000,
        ...
    }                                                                   OPTIONAL,
    ...
}

MeasResultListEUTRA ::=             SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {
    physicalCellIdentity                PhysicalCellIdentity,
    globalCellIdentity                  SEQUENCE {
        globalCellID-EUTRA                  GlobalCellId-EUTRA,
        tac-ID                              TrackingAreaCode,
        plmn-IdentityList                   PLMN-IdentityList2              OPTIONAL
    }                                                       OPTIONAL,
    measResult                          SEQUENCE {
        rsrpResult                          RSRP-Range                      OPTIONAL,
        rsrqResult                          RSRQ-Range                      OPTIONAL,
        ...
    }
}

MeasResultListUTRA ::=              SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {
    physicalCellIdentity                CHOICE {
        cellIentityFDD                      UTRA-FDD-CellIdentity,
        cellIentityTDD                      UTRA-TDD-CellIdentity
    },
    globalCellIdentity                  SEQUENCE {
        globalcellID-UTRA                   GlobalCellId-UTRA,
        lac-Id                              BIT STRING (SIZE (16))          OPTIONAL,
        rac-Id                              BIT STRING (SIZE (8))           OPTIONAL,
        plmn-IdentityList                   PLMN-IdentityList2              OPTIONAL
```

```
    }                                                                   OPTIONAL,
    measResult                          SEQUENCE {
        mode                                CHOICE {
            fdd                                 SEQUENCE {
                cpich-RSCP                          INTEGER (-5..91)            OPTIONAL,
                cpich-EcN0                          INTEGER (0..49)         OPTIONAL,
                ...
            },
            tdd                                 SEQUENCE {
                pccpch-RSCP                         INTEGER (-5..91),
                ...
            }
        }
    }
}

MeasResultListGERAN ::=             SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {
    physicalCellIdentity                SEQUENCE {
        geran-CarrierFreq                   GERAN-CarrierFreq,
        geran-CellIdentity                  GERAN-CellIdentity
    },
    globalCellIdentity                  SEQUENCE {
        globalcellID-GERAN                  GlobalCellId-GERAN,
        rac-Id                              BIT STRING (SIZE (8))           OPTIONAL
    }                                                                   OPTIONAL,
    measResult                          SEQUENCE {
        rssi                                BIT STRING (SIZE (6)),
        ...
    }
}

MeasResultsCDMA2000 ::=             SEQUENCE {
    hrpdPreRegistrationStatus           BOOLEAN,
    measResultListCDMA2000              MeasResultListCDMA2000
}

MeasResultListCDMA2000 ::=          SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {
    physicalCellIdentity                CDMA2000-CellIdentity,
    globalCellIdentity                  GlobalCellId-CDMA2000               OPTIONAL,
    measResult                          SEQUENCE {
        pilotPnPhase                        INTEGER (0..32767)              OPTIONAL,
        pilotStrength                       INTEGER (0..63),
        ...
    }
}

PLMN-IdentityList2 ::=              SEQUENCE (SIZE (1..5)) OF SEQUENCE {
    plmn-Identity                       PLMN-Identity
}

-- ASN1STOP
```

***MeasuredResults* field descriptions**
measId Identifies the measurement identity for which the reporting is being performed.
measResultServing 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 HRPD pre-registration status and the list of CDMA2000 measurements.

***MeasuredResults* field descriptions**
hrpdPreRegistrationStatus 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 1xRTT.
measResultListCDMA2000 List of measured results for the maximum number of reported best cells for a CDMA2000 measurement identity.
cdma2000-CellIdentity Identity of the CDMA2000 cell the results are for.
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. *pilotPnPhase* indicates the arrival time of a cdma2000 pilot, measured relative to the UE's time reference in units of PN chips, see [26] and is used in SRVCC handover procedure to 1xRTT, pilotStrength is the CDMA Pilot Strength, the ratio of pilot power to total power in the signal bandwidth of a CDMA Forward or Reverse Channel. The UE CDMA Upper layers shall set this field to FLOOR (-2 × 10 log10 PS) where PS is the strength of the CDMA2000 pilot channel for the identified cell, see [34].
cpich-RSCP According to CPICH_RSCP in [27]. Thirty-six spare values.
cpich-EcN0 According to CPICH_Ec/No in [27]. Fourteen spare values.
pccpch-RSCP According to P-CCPCH_RSCP_LEV in [29]. Thirty-six spare values.
rssi GERAN Carrier RSSI. RXLEV is mapped to a value between 0 and 63, [28]. When mapping the RXLEV value to the RSSI bit string, the first/leftmost bit of the bit string contains the most significant bit.
rac-Id The RAC identity read from broadcast information (defined in 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.

– *MeasurementBandwidth*

The IE *MeasurementBandwidth* used to indicate measurement bandwidth defined by the parameter Transmission Bandwidth Configuration "N_{RB}" [36.104]. The values mbw6, mbw15, mbw25, mbw50, mbw75, mbw100 indicate 6, 15, 25, 50, 75 and 100 resource blocks respectively.

MeasurementBandwidth information element

```
-- ASN1START

MeasurementBandwidth ::=                ENUMERATED {mbw6, mbw15, mbw25, mbw50, mbw75, mbw100}

-- ASN1STOP
```

***MeasurementBandwidth* field descriptions**
Void

– *MeasurementConfiguration*

The IE *MeasurementConfiguration* 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.

MeasurementConfiguration information element

```
-- ASN1START

MeasurementConfiguration ::=        SEQUENCE {
    -- Measurement objects
    measObjectToRemoveList              MeasObjectToRemoveList              OPTIONAL,   -- Need ON
    measObjectToAddModifyList           MeasObjectToAddModifyList           OPTIONAL,   -- Need ON
```

```
    -- Reporting configurations
    reportConfigToRemoveList            ReportConfigToRemoveList            OPTIONAL,   -- Need ON
    reportConfigToAddModifyList         ReportConfigToAddModifyList         OPTIONAL,   -- Need ON
    -- Measurement identities
    measIdToRemoveList                  MeasIdToRemoveList                  OPTIONAL,   -- Need ON
    measIdToAddModifyList               MeasIdToAddModifyList               OPTIONAL,   -- Need ON
    -- Other parameters
    quantityConfig                      QuantityConfig                      OPTIONAL,   -- Need ON
    measGapConfig                       MeasGapConfig                       OPTIONAL,   -- Need ON
    s-Measure                           RSRP-Range                          OPTIONAL,   -- Need ON
    hrpd-PreRegistrationInfo            HRPD-PreRegistrationInfo            OPTIONAL,   -- Need OP
    neighbourCellConfiguration          NeighbourCellConfiguration          OPTIONAL,   -- Need OP
    speedDependentParameters            CHOICE {
        disable                             NULL,
        enable                              SEQUENCE {
            mobilityStateParameters             MobilityStateParameters,
            speedDependentScalingParameters     ConnectedModeSpeedDependentScalingParameters
        }
    }                                                                       OPTIONAL,   -- Need ON
    ...
}

MeasIdToRemoveList ::=              SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {
    measId                              MeasId
}

MeasIdToAddModifyList ::=           SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {
    measId                              MeasId,
    measObjectId                        MeasObjectId,
    reportConfigId                      ReportConfigId
}

MeasObjectToRemoveList ::=          SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {
    measObjectId                        MeasObjectId
}

MeasObjectToAddModifyList ::=       SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {
    measObjectId                        MeasObjectId,
    measObject                          CHOICE {
        measObjectEUTRA                     MeasObjectEUTRA,
        measObjectUTRA                      MeasObjectUTRA,
        measObjectGERAN                     MeasObjectGERAN,
        measObjectCDMA2000                  MeasObjectCDMA2000,
        ...
    }
}

ReportConfigToRemoveList ::=        SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {
    reportConfigId                      ReportConfigId
}

ReportConfigToAddModifyList ::=     SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {
    reportConfigId                      ReportConfigId,
    reportConfig                        CHOICE {
        reportConfigEUTRA                   ReportConfigEUTRA,
        reportConfigInterRAT                ReportConfigInterRAT
    }
}

-- ASN1STOP
```

***MeasurementConfiguration* field descriptions**
measObjectToRemoveList List of measurement objects to remove.
measObjectToAddModifyList List of measurement objects to add/ modify.
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.
reportConfigToAddModifyList List of measurement reporting configurations to add/ modify.
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.
measIdToAddModifyList List of measurement identities to add/ modify.
measId Used to link a measurement object to a reporting configuration.
quantityConfig Specifies measurement quantities for UTRA, GERAN, or CDMA2000 and L3 filtering coefficients for E-UTRA, UTRA or GERAN measurements.
measGapConfig Used to configure measurement gap pattern and control activation/ deactivation of 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.
hrpd-PreRegistrationInfo The HRPD Pre-Registration Information tells the UE if it should pre-register with the HRPD network and identifies the Pre-registration zone to the UE.

– *QuantityConfig*

The IE *QuantityConfig* specifies the measurement quantities and filtering coefficients.

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} OPTIONAL,   -- Need OD
    measQuantityUTRA-TDD                ENUMERATED {pccpch-RSCP}            OPTIONAL,   -- Need OD
    filterCoefficient                   FilterCoefficient                   DEFAULT fc4
}

QuantityConfigGERAN ::=             SEQUENCE {
    measQuantityGERAN                   ENUMERATED {rssi},
    filterCoefficient                   FilterCoefficient                   DEFAULT fc2
}

QuantityConfigCDMA2000 ::=          SEQUENCE {
    measQuantityCDMA2000                ENUMERATED {pilotStrength, pilotPnPhaseAndPilotStrength}
```

```
}

FilterCoefficient ::=                   ENUMERATED {
                                            fc0, fc1, fc2, fc3, fc4, fc5,
                                            fc6, fc7, fc8, fc9, fc11, fc13,
                                            fc15, fc17, fc19, spare1, ...}

-- ASN1STOP
```

***QuantityConfig* field descriptions**
quantityConfigEUTRA Specifies filter configurations for E-UTRA measurements.
quantityConfigUTRA Specifies quantity configurations for UTRA measurements.
measQuantityUTRA Measurement quantity used for UTRA measurements.
quantityConfigGERAN Specifies quantity 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*.
filterCoefficient Specifies the filtering coefficient. Value fc0 corresponds to k=0, fc1 corresponds to k=1, and so on.
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                          INTEGER (0..30),
            timeToTrigger                       TimeToTrigger
        },
        periodical                              SEQUENCE {
            purpose                                 CHOICE {
                reportStrongestCells                    NULL,
                reportCGI                               NULL
            }
        }
    },
    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.

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) [36.214].

hysteresis
Hysteresis parameter for entering/ leaving measurement report triggering condition. The actual value is IE value * 0.5 dB.

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.
For RSRQ: RSRQ based threshold for event evaluation.

– *ReportConfigId*

The IE *ReportConfigId* is used to identify a measurement reporting configuration.

***ReportConfigId* information element**

```
-- ASN1START
```

```
ReportConfigId ::=                  INTEGER (1..maxReportConfigId)

-- ASN1STOP
```

***ReportConfigId* field descriptions**
Void

– *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 CDMA are the CDMA 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 [25] for details.

***ReportConfigInterRAT* information element**

```
-- ASN1START

ReportConfigInterRAT ::=            SEQUENCE {
    triggerType                         CHOICE {
        event                               SEQUENCE {
            eventId                             CHOICE {
                eventB1                             SEQUENCE {
                    b1-Threshold                        CHOICE {
                        b1-Threshold-CDMA2000               INTEGER (0..63),
                        b1-Threshold-UTRA                   ThresholdUTRA,
                        b1-Threshold-GERAN                  ThresholdGERAN
                    }
                },
                eventB2                             SEQUENCE {
                    b2-Threshold1                       ThresholdEUTRA,
                    b2-Threshold2                       CHOICE {
                        b2-Threshold2-CDMA2000              INTEGER (0..63),
                        b2-Threshold2-UTRA                  ThresholdUTRA,
                        b2-Threshold2-GERAN                 ThresholdGERAN
                    }
                },
                ...
            },
            hysteresis                      INTEGER(0..30),
            timeToTrigger                   TimeToTrigger
        },
        periodical                              SEQUENCE {
            purpose                             CHOICE {
                reportStrongestCells                NULL,
                reportStrongestCellsForSON          NULL,
                reportCGI                           NULL
            }
        }
    },
    maxReportCells                      INTEGER (1..maxCellReport),
    reportInterval                      ReportInterval,
    reportAmount                        ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    ...
}

ThresholdUTRA ::=                   CHOICE{
    thresholdUTRA-RSCP                  INTEGER(-5..91),
    thresholdUTRA-EcNO                  INTEGER(0..49)
}

ThresholdGERAN ::=              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.

hysteresis
Hysteresis parameter for entering/leaving measurement report triggering condition. The actual value is IE value * 0.5 dB.
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
For RSCP: The actual value is IE value – 115 dBm. Integer value according to mapping table in [29].
For EcNO: The actual value is (IE value – 49)/2 dB. Integer value according to mapping table in [29].
ThresholdGERAN
The actual value is IE value – 110 dBm. . Integer value according to mapping table in [28].

– *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*'.

ReportInterval information element

```
-- ASN1START

ReportInterval ::=                  ENUMERATED {
                                        ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240,
                                        min1, min6, min12, min30, min60, spare3, spare2, spare1}

-- ASN1STOP
```

ReportInterval field descriptions
ReportInterval
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

– *RSRP-Range*

The IE *RSRP-Range* specifies the value range used in RSRP measurements and thresholds.

RSRP-Range information element

```
-- ASN1START

RSRP-Range ::=                      INTEGER(0..97)

-- ASN1STOP
```

***RSRP-Range* field descriptions**

RSRP-Range
Integer value for RSRP according to mapping table in [16]

– *RSRQ-Range*

The IE *RSRQ-Range* specifies the value range used in RSRQ measurements and thresholds.

***RSRQ-Range* information element**

```
-- ASN1START

RSRQ-Range ::=                      INTEGER(0..34)

-- ASN1STOP
```

***RSRP-Range* field descriptions**

RSRQ-Range
Integer value for RSRP according to mapping table in [16]

– *TimeToTrigger*

The IE *TimeToTrigger* specifies the value range used for time to trigger parameter.

***TimeToTrigger* information element**

```
-- ASN1START

TimeToTrigger ::=                   ENUMERATED {
                                        ms0, ms10, ms20, ms40, ms64, ms80, ms100, ms128,
                                        ms160, ms200, ms256, ms320, ms640, ms1280, ms2560,
                                        ms5120}

-- ASN1STOP
```

***TimeToTrigger* field descriptions**

TimeToTrigger
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, ms10 corresponds to 10 ms, and so on.

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
```

***C-RNTI* field descriptions**

Void

– *IMSI*

The IE *IMSI* contains an International Mobile Subscriber Identity. Further information regarding how to set the IE are specified in TS 23.003 [27].

IMSI information element

```
-- ASN1START

IMSI ::=                                SEQUENCE (SIZE (6..21)) OF IMSI-Digit

IMSI-Digit::=                               INTEGER (0..9)

-- ASN1STOP
```

***IMSI* field descriptions**
IMSI
The first element contains the first IMSI digit, the second element the second IMSI digit and so on.

– *MMEC*

The IE *MMEC* identifies an MME within the scope of an MME Group within a PLMN.

MMEC information element

```
-- ASN1START

MMEC ::=                                BIT STRING (SIZE (8))

-- ASN1STOP
```

***MMEC* field descriptions**
Void

– *NAS-DedicatedInformation*

The IE *NAS-DedicatedInformation* is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this information.

NAS-DedicatedInformation information element

```
-- ASN1START

NAS-DedicatedInformation ::=        OCTET STRING

-- ASN1STOP
```

***NAS-DedicatedInformation* field descriptions**
Void

– *NeighbourCellConfiguration*

The IE *NeighbourCellConfiguration* is used to provide the information related to MBSFN and TDD UL/DL configuration of intra-frequency neighbour cells.

NeighbourCellConfiguration information element

```
-- ASN1START

NeighbourCellConfiguration ::=      BIT STRING (SIZE (2))
```

```
-- ASN1STOP
```

***NeighbourCellConfiguration* field descriptions**
neighbourCellConfiguration
Provides information related to MBSFN and TDD UL/DL configuration of intra-frequency neighbour cells 00: Not all neighbour cells have the same MBSFN subframe allocation as serving cell 10: All neighbour cells have same MBSFN subframe allocation as 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.

– *P-Max*

The IE *P-Max* is used to limit the UE's uplink transmission power on a carrier frequency and to calculate the parameter *Pcompensation* defined in [4].

P-Max information element

```
-- ASN1START

P-Max ::=               INTEGER (-30..33)

-- ASN1STOP
```

***P-Max* field descriptions**
P-Max
Maximum allowed transmission power on an uplink carrier frequency in dBm. The UE shall apply the minimum of this value and the UE's capability as the maximum power P_{MAX} defined in [23].

– *RAT-Type*

The IE *RAT-Type* is used to indicate the type of radio access technology (RAT), including E-UTRA.

RAT-Type information element

```
-- ASN1START

RAT-Type ::=                        ENUMERATED {
                                        eutra, utran, geran, cdma2000-1xrttBandClass,
                                        spare4, spare3, spare2, spare1, ...}

-- ASN1STOP
```

***RAT-Type* field descriptions**
Void

– *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
```

***RRC-TransactionIdentifier* field descriptions**
Void

– *S-TMSI*

The IE *S-TMSI* contains an S-Temporary Mobile Subscriber Identity.

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-EUTRA-Capability*

The IE UE-EUTRA-Capability is used to convey the E-UTRA UE Radio Access Capability Parameters [5] to the network.

UE-EUTRA-Capability information element

```
-- ASN1START

UE-EUTRA-Capability ::=             SEQUENCE {
    accessStratumRelease                AccessStratumRelease,
    ue-Category                         INTEGER (1..16),                        -- value range FFS
    pdcp-Parameters                     PDCP-Parameters,
    phyLayerParameters                  PhyLayerParameters,
    rf-Parameters                       RF-Parameters,
    measurementParameters               MeasurementParameters,
    interRAT-Parameters                 SEQUENCE {
        utraFDD                             IRAT-UTRA-FDD-Parameters                OPTIONAL,
        utraTDD128                          IRAT-UTRA-TDD128-Parameters             OPTIONAL,
        utraTDD384                          IRAT-UTRA-TDD384-Parameters             OPTIONAL,
        utraTDD768                          IRAT-UTRA-TDD768-Parameters             OPTIONAL,
        geran                               IRAT-GERAN-Parameters                   OPTIONAL,
        cdma2000-HRPD                       IRAT-CDMA2000-HRPD-Parameters           OPTIONAL,
        cdma2000-1xRTT                      IRAT-CDMA2000-1xRTT-Parameters          OPTIONAL
    },
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

AccessStratumRelease ::=            ENUMERATED {
                                        rel8, spare7, spare6, spare5, spare4, spare3,
                                        spare2, spare1, ...}

PDCP-Parameters ::=                 SEQUENCE {
    supportedROHCprofiles               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}                DEFAULT cs16,
    ...
}

PhyLayerParameters ::=              SEQUENCE {
    ue-TxAntennaSelectionSupported      BOOLEAN,
    ue-SpecificRefSigsSupported         BOOLEAN
}

RF-Parameters ::=                   SEQUENCE {
    supportedEUTRA-BandList             SupportedEUTRA-BandList
}

SupportedEUTRA-BandList ::=         SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    eutra-Band                          INTEGER (1..64),
    halfDuplex                          BOOLEAN
}

MeasurementParameters ::=           SEQUENCE {
    eutra-BandList                      EUTRA-BandList
}

EUTRA-BandList ::=                  SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    interFreqEUTRA-BandList             InterFreqEUTRA-BandList,
    interRAT-BandList                   InterRAT-BandList       OPTIONAL
}

InterFreqEUTRA-BandList ::=         SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    interFreqNeedForGaps                BOOLEAN
}

InterRAT-BandList ::=               SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    interRAT-NeedForGaps                BOOLEAN
}

IRAT-UTRA-FDD-Parameters ::=        SEQUENCE {
    supportedUTRA-FDD-BandList          SupportedUTRA-FDD-BandList
}

SupportedUTRA-FDD-BandList ::=      SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    utra-FDD-Band                       ENUMERATED {
                                            bandI, bandII, bandIII, bandIV, bandV, bandVI,
                                            bandVII, bandVIII, bandIX, bandX, bandXI,
                                            bandXII, bandXIII, bandXIV, bandXV, bandXVI, ...}
}

IRAT-UTRA-TDD128-Parameters ::=     SEQUENCE {
    supportedUTRA-TDD128BandList        SupportedUTRA-TDD128BandList
}

SupportedUTRA-TDD128BandList ::=    SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    utra-TDD128Band                     ENUMERATED {
                                            a, b, c, d, e, f, g, h, i, j, k, l, m, n,
                                            o, p, ...}
}

IRAT-UTRA-TDD384-Parameters ::=     SEQUENCE {
    supportedUTRA-TDD384BandList        SupportedUTRA-TDD384BandList
}

SupportedUTRA-TDD384BandList ::=        SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    utra-TDD384Band                     ENUMERATED {
                                            a, b, c, d, e, f, g, h, i, j, k, l, m, n,
                                            o, p, ...}
}

IRAT-UTRA-TDD768-Parameters ::=     SEQUENCE {
    supportedUTRA-TDD768BandList        SupportedUTRA-TDD768BandList
}

SupportedUTRA-TDD768BandList ::=    SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    utra-TDD768Band                     ENUMERATED {
                                            a, b, c, d, e, f, g, h, i, j, k, l, m, n,
                                            o, p, ...}
}

IRAT-GERAN-Parameters ::=           SEQUENCE {
```

```
    supportedGERAN-BandList             SupportedGERAN-BandList,
    interRAT-PS-HO-ToGERAN              BOOLEAN
}

SupportedGERAN-BandList ::=         SEQUENCE (SIZE (1..maxBands)) OF SEQUENCE {
    geran-Band                          ENUMERATED {
                                            gsm450, gsm480, gsm850, gsm900P, gsm900E, gsm1800,
                                            gsm1900, spare1, ...}
}

IRAT-CDMA2000-HRPD-Parameters ::=   SEQUENCE {
    supportedHRPD-BandList              SupportedHRPD-BandList,
    cdma2000-HRPD-TxConfig              ENUMERATED {single, dual},
    cdma2000-HRPD-RxConfig              ENUMERATED {single, dual}
}

SupportedHRPD-BandList ::=          SEQUENCE (SIZE (0..maxCDMA-BandClass)) OF SEQUENCE {
    cdma2000-HRPD-Band                  CDMA2000-Bandclass
}

IRAT-CDMA2000-1xRTT-Parameters ::=  SEQUENCE {
    supported1xRTT-BandList             Supported1xRTT-BandList,
    cdma2000-1xRTT-TxConfig             ENUMERATED {single, dual},
    cdma2000-1xRTT-RxConfig             ENUMERATED {single, dual}
}

Supported1xRTT-BandList ::=         SEQUENCE (SIZE (0..maxCDMA-BandClass)) OF SEQUENCE {
    cdma2000-1xRTT-Band                 CDMA2000-Bandclass
}

-- ASN1STOP
```

Editor's note: The extension mechanisms for this IE need to be considered.

Editor's note: The following GSM band seem to be missing: GSM 710, GSM 750, GSM 810, GSM 900R.

UE-EUTRA-Capability field descriptions
accessStratumRelease Set to rel8 in this version of the specification.
maxNumberROHC-ContextSessions cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on.
ue-Category UE category as defined in [5]. Set to values 1 to 5 in this version of the specification.
eutra-Band E-UTRA band as defined in [36.101].
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.

eutra-BandList
One entry corresponding to each supported E-UTRA band listed in the same order as in *supportedEUTRA-BandList*.
interFreqEUTRA-BandList
One entry corresponding to each supported E-UTRA band listed in the same order as in *supportedEUTRA-BandList*.
interFreqNeedForGaps
Indicates need for measurement gaps when operating on the E-UTRA band given by the entry in *eutraBandList* and measuring on the E-UTRA band given by the entry in *interFreqEUTRA-BandList*.
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 *eutraBandList* and measuring on the inter-RAT band given by the entry in the *interRAT-Parameters*.
utra-FDD-Band
UTRA band as defined in TS 25.101 [17].
utra-TDD128Band
UTRA band as defined in TS 25.102 [18].
utra-TDD384Band
UTRA band as defined in TS 25.102 [18].
utra-TDD768Band
UTRA band as defined in TS 25.102 [18].
geran-Band
GERAN band as defined in TS 45.005 [20].
cdma2000-HRPD-Band
CDMA2000 HRPD band class.
cdma2000-1xRTT-Band
CDMA2000 1xRTT band class.

Editor's note: The IE *UE-EUTRA-Capability* does not include AS security capability information, since these are assumed to be the same as the NAS-security capabilities. Consequently it is also assumed that AS need not provide "man-in-the-middle" protection for the security capabilities, i.e., it is assumed that NAS provides this functionality.

– *UE-TimersAndConstants*

The IE *UE-TimersAndConstants* contains timers and constants used by the UE in either RRC_CONNECTED or RRC_IDLE.

UE-TimersAndConstants information element

```
-- ASN1START

UE-TimersAndConstants ::=           SEQUENCE {
    t300                                ENUMERATED {
                                            ms100, ms200, ms400, ms600, ms1000, ms1500,
                                            ms2000, spare1},
    t301                                ENUMERATED {
                                            ms100, ms200, ms400, ms600, ms1000, ms1500,
                                            ms2000, spare1},                -- FFS, see eNote below
    t310                                ENUMERATED {
                                            ms0, ms50, ms100, ms200, ms500, ms1000, ms2000,
                                            spare1},
```

```
    n310                                ENUMERATED {
                                            spare7, spare6, spare5, spare4, spare3,
                                            spare2, spare1, spare0},
    t311                                ENUMERATED {
                                            ms1000, ms3000, ms5000, ms10000, ms15000,
                                            ms20000, ms30000, spare1},
    n311                                ENUMERATED {
                                            spare7, spare6, spare5, spare4, spare3,
                                            spare2, spare1, spare0},
    ...
}

-- ASN1STOP
```

Editor's note: It is FFS if t-301 is signalled separately or e.g. always uses the same value as t300.

Editor's note: The value range of t310 may be revisited when DRX impacts on physical layer problem monitoring are known.

***UE-TimersAndConstants* field descriptions**
t3xy
Timers are described in section 7.3. 0ms corresponds with 0 ms, 50ms corresponds with 50 ms and so on

6.4 RRC multiplicity and type constraints values

– Multiplicity and type constraints definitions

Editor's note: A brief descriptive text to be added here (FFS).

```
-- ASN1START

maxAC                       INTEGER ::= 5   --
maxBands                    INTEGER ::= 64  -- Maximum number of bands listed in EUTRA UE caps
maxCDMA-BandClass           INTEGER ::= 31  -- Maximum value of the CDMA band classes
maxCellBlack                INTEGER ::= 16  -- Maximum number of blacklisted cells
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
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-Carrier            INTEGER ::= 32  -- Maximum number of GERAN carrier fequencies
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    FFS
maxMBSFN-Allocations        INTEGER ::= 8   -- Maximum number of MBSFN frame allocations with
                                            -- different offset
maxMCS-1                    INTEGER ::= 16  -- Maximim 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 fequencies    FFS
maxUTRA-TDD-Carrier         INTEGER ::= 16  -- Maximum number of UTRA TDD carrier fequencies    FFS

-- ASN1STOP
```

Editor's note: The value of maxDRB was selected to align with SA2.

Editor's note: A table with parameter descriptions should be considered as an alternative to the inline comments above. If there are more than a few words of comment, the code above gets rather messy.

– 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,
    ConnectedModeSpeedDependentScalingParameters,
    CDMA2000-SystemTimeInfo,
    C-RNTI,
    MeasId,
    MeasIdToAddModifyList,
    MeasObjectToAddModifyList,
    MobilityStateParameters,
    NeighbourCellConfiguration,
    PhysicalCellIdentity,
    QuantityConfig,
    ReportConfigToAddModifyList,
    RSRP-Range,
    maxCellMeas,
    maxMeasId
FROM EUTRA-RRC-Definitions;

-- ASN1STOP
```

– Var*MeasurementConfiguration*

The UE variable *VarMeasurementConfiguration* includes the accumulated configuration of the measurements to be performed by the UE, covering intra-frequency, inter-frequency and inter-RAT mobility related measurements as well as the measurement gap configuration.

***VarMeasurementConfiguration* UE variable**

```
-- ASN1START

VarMeasurementConfiguration ::=     SEQUENCE {
    -- Measurement identities
    measIdList                          MeasIdToAddModifyList               OPTIONAL,
    -- Measurement objects
    measObjectList                      MeasObjectToAddModifyList           OPTIONAL,
    -- Reporting configurations
    reportConfigList                    ReportConfigToAddModifyList         OPTIONAL,
    -- Other parameters
```

```
    quantityConfig                      QuantityConfig                      OPTIONAL,
    s-Measure                           RSRP-Range                          OPTIONAL,
    cdma2000-SystemTimeInfo             CDMA2000-SystemTimeInfo             OPTIONAL,
    neighbourCellConfiguration          NeighbourCellConfiguration          OPTIONAL,
    speedDependentParameters            SEQUENCE {
        mobilityStateParameters             MobilityStateParameters,
        speedDependentScalingParameters     ConnectedModeSpeedDependentScalingParameters
    }                                                                       OPTIONAL
}

-- ASN1STOP
```

– VarMeasurementReports

The UE variable *VarMeasurementReports* includes information about the measurements for which the triggering conditions have been met.

VarMeasurementReports UE variable

```
-- ASN1START

VarMeasurementReports ::=               SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {
    -- List of measurement that have been triggered
    measId                              MeasId,
    cellsTriggeredList                  CellsTriggeredList              OPTIONAL,
    numberOfReportsSent                 INTEGER
}

CellsTriggeredList ::=              SEQUENCE (SIZE (1..maxCellMeas)) OF SEQUENCE {
    cellIdentity                        PhysicalCellIdentity
}

-- ASN1STOP
```

– VarShortMAC-Input

The UE variable V*arShortMAC-Input* specifies the input used to generate the shortMAC-I. The UE shall store the variable in accordance with the ASN.1 specified in the following.

VarShortMAC-Input UE variable

```
-- ASN1START

VarShortMAC-Input ::=                   SEQUENCE {
    cellIdentity                            CellIdentity,
    physicalCellIdentity                    PhysicalCellIdentity,
    c-RNTI                                  C-RNTI
}
-- ASN1STOP
```

VarShortMAC-Input field descriptions
cellIdentity   Set to CellIdentity of the current cell.
physicalCellIdentity   Set to PhysicalCellIdentity 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 constraints definitions

This section includes multiplicity and type constraints applicable (only) for UE variables.

```
-- ASN1START


-- ASN1STOP
```

– End of *EUTRA-UE-Variables*

```
-- ASN1START

END

-- ASN1STOP
```

7.2 Counters

Counter	Reset	Incremented	When reaching max value

7.3 Timers

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 Information* 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*	Upon entering RRC_CONNECTED	Discard the cell reselection priority information provided by dedicated signalling.
T321	Upon receiving *measurementConfiguration* including a *reportConfig* with the *purpose* set to *reportCGI*	Upon receiving *measurementConfiguration* that includes removal of the *reportConfig* with the *purpose* set to *reportCGI*	Stop performing the related measurements

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 and an extension (FFS).

RRC PDUs shall be mapped to and from PDCP SDUs (in case of DCCH) or RLC SDUs (in case of PCCH, BCCH or CCCH) upon transmission and reception as follows:

- when delivering an RRC PDU as an PDCP SDU to the PDCP layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the PDCP SDU and onwards; and

- when delivering an RRC PDU as an RLC SDU to the RLC layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the RLC SDU and onwards; and

- upon reception of an PDCP SDU from the PDCP layer, the first bit of the PDCP SDU shall represent the first bit of the RRC PDU and onwards; and

- upon reception of an RLC SDU from the RLC layer, the first bit of the RLC SDU shall represent the first bit of the RRC PDU and onwards.

8.3 Basic production

The 'basic production' is obtained by applying UNALIGNED PER to the abstract syntax value (the ASN.1 description) as specified in X.691. It always contains a multiple of 8 bits.

8.4 Extension

The following rules apply with respect to the use of protocol extensions:

- A transmitter compliant with this version of the specification shall, unless explicitly indicated otherwise on a PDU type basis, set the extension part empty. Transmitters compliant with a later version may send non-empty extensions;

- A transmitter compliant with this version of the specification shall set spare bits to zero;

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

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	
prioritizedBitRate	Infinity		
bucketSizeDuration	N/A		
logicalChannelGroup	0		

NOTE: Integrity protection is not used for the *RRCConnectionReestablishment* message

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

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* *>maxRetxThreshold*	 45 Infinity Infinity 4		
dl-RLC-Config *>t-Reordering* *>t-StatusProhibit*	 35 0		
Logical channel configuration			
priority	1	Highest priority	
prioritizedBitRate	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*	 45 Infinity Infinity 4		
dl-RLC-Config *>t-Reordering* *>t-StatusProhibit*	 35 0		
Logical channel configuration			
priority	3		
prioritizedBitRate	Infinity		
bucketSizeDuration	N/A		
logicalChannelGroup	0		

9.2.2 Default MAC main configuration

Parameters

Name	Value	Semantics description	Ver

Name	Value	Semantics description	Ver
MAC main configuration			
maxHARQ-tx	5		
periodicBSR-Timer	Infinity		
retxBSR-Timer	sf2560		
ttiBundling	FALSE		
drx-Configuration *>shortDRX*	disable disable		
phr-Configuration	disable		

9.2.3 Default semi-persistent scheduling configuration

SPS-Configuration *>sps-ConfigurationDL* *>sps-ConfigurationUL*	 disable disable		

9.2.4 Default physical channel configuration

Parameters

Name	Value	Semantics description	Ver
PDSCH-ConfigDedicated *>p-a*	 dB0		
PUCCH-ConfigDedicated *> tddAckNackFeedbackMode* *>ackNackRepetition*	 bundling disable	Only valid for TDD mode	
PUSCH-ConfigDedicated *>deltaOffset-ACK-Index* *> deltaOffset-RI-Index* *> deltaOffset-CQI-Index*	 10 12 15		
UplinkPowerControlDedicated *>p0-UePUSCH* *> deltaMCS-Enabled* *> accumulationEnabled* *> p0-UePUCCH* *> pSRS-Offset*	 0 en0 (disabled) TRUE 0 7		
CQI-Reporting *> CQI-ReportingPeriodic*	 disable		
tpc-pdcch-ConfigPUCCH	disable		
tpc-pdcch-ConfigPUSCH	disable		
SoundingRsUl-Config	disable		
AntennaInformationDedicated *>transmissionMode* *>codebookSubsetRestriction* *>ue-TransmitAntennaSelection*	tm1, tm2 N/A disable	For 1 antenna, single antenna transmission mode 1 is used as default. For 2 and 4 antennas transmission mode 2, corresponding to transmit diversity, is used as default.	
SchedulingRequest-Configuration	disable		

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.

Editor's note: The use of extension markers is FFS.

10.2 RRC messages transferred across network nodes

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
    AntennaInformationCommon,
    CellIdentity,
    C-RNTI,
    DL-DCCH-Message,
    MasterInformationBlock,
    MeasurementConfiguration,
    NextHopChainingCount,
    PhysicalCellIdentity,
    RadioResourceConfigDedicated,
    SecurityConfiguration,
    ShortMAC-I,
    SystemInformationBlockType1,
    SystemInformationBlockType2,
    UECapabilityInformation
FROM EUTRA-RRC-Definitions;

-- ASN1STOP
```

– *InterNode-Message*

The *InterNode-Message* class is the set of RRC messages that may be sent across the X2 or the S1 interface.

```
-- ASN1START

InterNode-Message ::= SEQUENCE {
    message                 InterNode-MessageType
}

InterNode-MessageType ::= CHOICE {
    c1                      CHOICE {
        interRAT-Message                        InterRAT-Message,
        handoverCommand                         HandoverCommand,
        handoverPreparationInformation          HandoverPreparationInformation,
        ueRadioAccessCapabilityInformation      UERadioAccessCapabilityInformation
    },
    messageClassExtension   SEQUENCE {}
}

-- ASN1STOP
```

10.2.1 INTER RAT MESSAGE

Inter-RAT message, e.g. a handover command

Transfer characteristics: tbs

***InterRAT-Message* message**

```
-- ASN1START

InterRAT-Message ::=                SEQUENCE {
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            interRAT-Message-r8                 InterRAT-Message-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

InterRAT-Message-r8-IEs ::=         SEQUENCE {
    interRAT-Message                    OCTET STRING,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

***InterRAT-Message* field descriptions**
interRAT-Message
E.g., the source eNB sends the handover command generated by the target RAN generates the entire RRC to the UE.

10.2.2 HANDOVER COMMAND

E-UTRA RRC handover command

Transfer characteristics: tbs

***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
Target eNB generates the entire DL-DCCH-Message including the *RRCConnectionReconfiguration* message as signalled to the UE.

10.2.3 HANDOVER PREPARATION INFORMATION

E-UTRA RRC information used by the target eNB during handover preparation, including UE capability information

Transfer characteristics: tbs

***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 {
    as-Configuration                    AS-Configuration                    OPTIONAL,
    rrm-Configuration                   RRM-Configuration                   OPTIONAL,
    as-Context                          AS-Context,
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL
}

-- ASN1STOP
```

***HandoverPreparationInformation* field descriptions**
as-Configuration The complete radio resource configuration. Applicable in case of intra-E-UTRA handover.
rrm-Configuration Local E-UTRAN context used depending on the target node's implementation, which is mainly used for the RRM purpose. FFS if applicable for Inter-RAT HO
as-Context Local E-UTRAN context required by the target node.

10.2.4 UE RADIO ACCESS CAPABILITY INFORMATION

UE radio access capability transfer, covering both upload to and download from the MME.

Transfer characteristics: tbs

***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, UTRA and CDMA2000-1xRTT Bandclass radio access capabilities (separated).

10.3 IE definition

– *AS-Configuration*

The *AS-Configuration* 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-Configuration* information element**

```
-- ASN1START

AS-Configuration ::=                SEQUENCE {
    sourceMeasurementConfiguration      MeasurementConfiguration,
    sourceRadioResourceConfiguration    RadioResourceConfigDedicated,
    sourceSecurityConfiguration         SecurityConfiguration,
    sourceUE-Identity                   C-RNTI,
    sourceMasterInformationBlock        MasterInformationBlock,
    sourceSystemInformationBlockType1   SystemInformationBlockType1,
    sourceSystemInformationBlockType2   SystemInformationBlockType2,
    antennaInformationCommon            AntennaInformationCommon,
    ...
}

-- ASN1STOP
```

NOTE The AS-Configuration 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-Configuration field descriptions
sourceMeasurementConfiguration
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.
sourceRadioResourceConfiguation
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.
sourceSecurityConfiguration
This field provides the AS integrity protection (CP) and AS ciphering (CP and UP) configuration and the next hop chaining count 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.
antennaInformationCommon
This field provides information about the number of antenna ports in the source cell

– *AS-Context*

The IE *AS-Context* is used to transfer local E-UTRAN context required by the target node.

***AS-Context* information element**

```
-- ASN1START
```

```
AS-Context ::=                          SEQUENCE {
    ue-RadioAccessCapabilityInfo            OCTET STRING (CONTAINING UECapabilityInformation),
    ue-SecurityCapabilityInfo               OCTET STRING,
    reestablishmentInfo                     ReestablishmentInfo
}

-- ASN1STOP
```

***AS-Context* field descriptions**
ue-RadioAccessCapabilityInfo Including E-UTRA, GERAN and UTRA radio access capabilities (separated)
ue-SecurityCapabilityInfo UE security capability information as specified in TS 36.413 [39].
reestablishmentInfo Including information needed for the RRC connection re-establishment

– *Key-eNodeB-Star*

The IE *Key-eNodeB-Star* is used to forward the KeNB* parameter at handover

Key-eNodeB-Star information element

```
-- ASN1START

Key-eNodeB-Star ::=                 BIT STRING (SIZE (256))

-- ASN1STOP
```

***Key-eNodeB-Star* field descriptions**
Key-eNodeB-Star Parameter KeNB*: See TS 33.401 [32, 7.2.8.4]

– *ReestablishmentInfo*

The *ReestablishmentInfo* IE contains information needed for the RRC connection re-establishment.

ReestablishmentInfo information element

```
-- ASN1START

ReestablishmentInfo ::=             SEQUENCE {
    sourcePhysicalCellIdentity          PhysicalCellIdentity,
    targetCellShortMAC-I                ShortMAC-I,
    additionalReestabInfoList           AdditionalReestabInfoList               OPTIONAL,
    ...
}

AdditionalReestabInfoList ::=       SEQUENCE ( SIZE (1..maxReestabInfo) ) OF SEQUENCE{
    cellIdentity                        CellIdentity,
    key-eNodeB-Star                     Key-eNodeB-Star,
    shortMAC-I                          ShortMAC-I
}
-- ASN1STOP
```

ReestablishmentInfo field descriptions
sourcePhysicalCellIdentity 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.

– *RRM-Configuration*

The *RRM-Configuration* 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-Configuration* information element**

```
-- ASN1START

RRM-Configuration ::=       SEQUENCE {
    ue-InactiveTime             ENUMERATED {
                                    v1sec, v2sec, v3sec, v5sec, v7sec, v10sec, v15sec, v20sec,
                                    v25sec, v30sec, v40sec, v50sec, v1min, v1min20sec, v1min40sec,
                                    v2min, v2min30sec, v3min, v3min30sec, v4min, v5min, v6min,
                                    v7min, v8min, v9min, v10min, v12min, v14min, v17min, v20min,
                                    v24min, v28min, v33min, v38min, v44min, v50min, v1hr,
                                    v1hr30min, v2hr, v2hr30min, v3hr, v3hr30min, v4hr, v5hr, v6hr,
                                    v8hr, v10hr, v13hr, v16hr, v20hr, v1day, v1day12hr, v2day,
                                    v2day12hr, v3day, v4day, v5day, v7day, v10day, v14day, v19day,
                                    v24day, v30day, morethan30day}      OPTIONAL,
    ...
}

-- ASN1STOP
```

***RRM-Configuration* 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.

10.4 RRC multiplicity and type constraints values

– Multiplicity and type constraints definitions

This section includes multiplicity and type constraints applicable (only) to interactions between network nodes

```
-- 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-Configuration*

The *AS-Configuration* 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-Configuration* 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*.

The following IEs, which are optional for eNB to UE communication, are mandatory in the *sourceRadioResourceConfiguration* if the related functionality is configured:

Name	Presence in clause 6	Comment
RadioResourceConfigDedicated		
> srb-ToAddModifyList	OPTIONAL, -Need ON	Mandatory for all SRBs configured
>> rlc-Configuration	OPTIONAL, -Cond Setup	
>> logicalChannelConfig	OPTIONAL, -Cond Setup	
>drb-ToAddModifyList	OPTIONAL, -Need ON	Mandatory for all DRBs configured
>> pdcp-Configuration	OPTIONAL, -Cond Setup	-
>>> discardTimer	OPTIONAL, -Cond Setup	-
>>> rlc-AM	OPTIONAL, -Cond Rlc-AM	The conditional presence applies
>>> rlc-UM	OPTIONAL, -Cond Rlc-UM	The conditional presence applies
>> rlc-Configuration	OPTIONAL, -Cond Setup	-
>> rb-MappingInfo	OPTIONAL, -Cond Setup-HO	-
>> logicalChannelConfig	OPTIONAL, -Cond Setup	-
>>> ul-SpecificParameters	OPTIONAL, -Cond UL	-
> mac-MainConfig	OPTIONAL, -Cond Setup	-
>> dl-SCH-Configuration	OPTIONAL, -Need ON	-
>> ul-SCH-Configuration	OPTIONAL, -Need ON	-
>>> maxHARQ-Tx	OPTIONAL, -Cond ConnSU	-
>> periodicBSR-Timer	OPTIONAL, -Need ON	-
>> drx-Configuration	OPTIONAL, -Need ON	-
>>> shortDRX	OPTIONAL, -Need ON	-
>> phr-Configuration	OPTIONAL, -Need ON	-
> physicalConfigDedicated	OPTIONAL, -Cond Misc	-
>> pdsch-Configuration	OPTIONAL, -Need ON	-
>> pucch-Configuration	OPTIONAL, -Need ON	-
>> pusch-Configuration	OPTIONAL, -Need ON	-
>> uplinkPowerControl	OPTIONAL, -Need ON	-
>> tpc-PDCCH-ConfigPUCCH	OPTIONAL, -Need ON	-
>> tpc-PDCCH-ConfigPUSCH	OPTIONAL, -Need ON	-
>> cqi-Reporting	OPTIONAL, -Need ON	-
>>> nomPDSCH-RS-EPRE-Offset	OPTIONAL	-
>>> cqi-ReportingPeriodic	OPTIONAL, -Need ON	-
>> soundingRsUl-Config	OPTIONAL, -Need ON	-
>> antennaInformation	OPTIONAL, -Need ON	-
>> schedulingRequestConfig	OPTIONAL, -Need ON	-
> sps-Configuration	OPTIONAL, -Need ON	-
>> sps-ConfigurationDL	OPTIONAL, -Need ON	-
>> sps-ConfigurationUL	OPTIONAL, -Need ON	-
>>> p0-Persistent	OPTIONAL, -Need OP	-

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).

Procedure title:	E-UTRAN -> UE	UE -> E-UTRAN	N	Notes
RRC Connection Control Procedures				
RRC connection establishment	*RRCConnectionSetup*	*RRCConnectionSetupComplete*	[3-10 FFS]	
RRC connection release	*RRCConnectionSetupRelease*		NA	
RRC connection re-configuration (radio resource configuration)	*RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	[3-10 FFS]	
RRC connection re-configuration (measurement configuration)	*RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	[3-10 FFS]	
RRC connection re-configuration (intra-LTE mobility)	*RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	[3-10 FFS]	
RRC connection re-establishment	*RRCConnectionReestablishment*	*RRCConnectionReestablishmentComplete*	[3-10 FFS]	
Initial security activation	*SecurityModeCommand*	*SecurityModeCommandComplete/SecurityModeCommandFailure*	[3-10 FFS]	
Initial security activation + RRC connection re-configuration (RB establishment)	*SecurityModeCommand, RRCConnectionReconfiguration*	*RRCConnectionReconfigurationComplete*	[FFS]	The two DL messages are transmitted in the same TTI
Paging	*Paging*		NA	
Inter RAT mobilty				
Handover to E-UTRA	*RRCConnectionReconfiguration (sent by other RAT)*	*RRCConnectionReconfigurationComplete*	NA	
Handover from E-UTRA	*MobilityFromEUTRACommand*		NA	
Handover from E-UTRA to CDMA2000	*HandoverFromEUTRAPreparationRequest (CDMA 2000)*		NA	Used to trigger the handover preparation procedure with a CDMA2000 RAT.
Measurement procedures				
Measurement Reporting		*MeasurementReport*	NA	FFS
Other procedures				
UE capability transfer	*UECapabilityEnquiry*	*UECapabilityInformation*	[3-10 FFS]	

Editor's note: For the initial RRC connection establishment when the UE does not have any ongoing data transmissions, a very tight requirement on N shall be defined.

Editor's note: It is FFS if this section should include performance requirements for the acquisition of system information.

Editor's note: There may be a need to define the assumption regarding the RACH procedure as well as the exact point when the UL message is considered as ready for transmission

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 Principles to ensure compatibility

It shall be possible to inter-work different versions of the RRC protocol.

The protocol shall specify mechanisms such that new PDU types can be introduced without causing unexpected behaviour or damage.

The protocol shall specify mechanisms such that PDU extensions are allowed in a compatible way. Those may include:

- Mechanisms that allow the encoder to selectively include PDU extensions, which are known and can be decoded in the decoder;
- Mechanisms that allow the decoder to skip unknown PDU extensions and complete the decoding of the known parts of the PDU.

In case the protocol allows the transfer of spare values or extension of the value set, the behaviour of the receiving entity not comprehending these values shall be specified.

A.3 PDU specification

A.3.1 General principles

A.3.1.1 ASN.1 sections

The RRC PDU contents shall be formally and completely described using abstract syntax notation (ASN.1) [X.680, X.681 (02/2002)].

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 shall begin 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 shall end 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 shall not contain any ASN.1 code significant for the complete description of the RRC PDU contents. The complete ASN.1 code may be extracted by copying all the text paragraphs between an ASN.1 start tag and the following ASN.1 stop tag in the order they appear, throughout the specification.

NOTE: A typical procedure for extraction of the complete ASN.1 code consists of a first step where the entire RRC PDU contents description (ultimately the entire specification) is saved into a plain text (ASCII) file format, followed by a second step where the actual extraction takes place, based on the occurrence of the ASN.1 start and stop tags.

A.3.1.2 ASN.1 identifier naming conventions

The naming of identifiers (i.e., the ASN.1 field and type identifiers) should be based on the following guidelines:

- Message (PDU) identifiers should be ordinary mixed case without hyphenation. These identifiers, *e.g.*, the *RRCConnectionModificationCommand*, should be used for reference in the procedure text. Abbreviated forms of these identifiers should not be used.

- Type identifiers other than PDU identifiers should be ordinary mixed case, with hyphenation used to set off acronyms only where an adjacent letter is a capital, *e.g.*, *EstablishmentCause*, *SelectedPLMN* (not *Selected-PLMN*, since the "d" in "Selected" is lowercase), *InitialUE-Identity* and *MeasuredSFN-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. Abbreviations may be used. 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 (cf., sub-clause A.ffs), 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.

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
Param(s)	Parameter(s)
Persist	Persistent
Reestab	Reestablishment
Req	Request
Sched	Scheduling
Thresh	Threshold
Transm	Transmission
UL	Uplink

NOTE: The table A.3.1.2.1-1 is not exhaustive. Additional abbreviations may be used in ASN.1 identifiers when needed.

A.3.1.3 Text references using ASN.1 identifiers

A text reference into the RRC PDU contents description from other parts of the specification is made using the ASN.1 field or type identifier of the referenced element. The ASN.1 field and type identifiers used in text references should be

in the *italic font style*. The "do not check spelling and grammar" attribute in Word should be set. Quotation marks (i.e., " ") should not be used around the ASN.1 field or type identifier.

A reference to an RRC PDU type should be made using the corresponding ASN.1 type identifier followed by the word "message", e.g., a reference to the *RRCConnectionRelease* message.

A reference to a specific part of an RRC PDU, or to a specific part of any other ASN.1 type, should be made using the corresponding ASN.1 field identifier followed by the word "field", e.g., a reference to the *prioritizedBitRate* field in the example below.

```
-- /example/ ASN1START

LogicalChannelConfig ::=            SEQUENCE {
    ul-SpecificParameters               SEQUENCE {
        priority                            Priority,
        prioritizedBitRate                  PrioritizedBitRate,
        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.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 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.

The ASN.1 section specifying the contents of a PDU type shall be followed by a *field description* table where a further description of, e.g., the semantic properties of the information elements may be included. The general format of this table is shown in the example below.

***%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.

If the field description table is empty, the header row shall be followed by a single row with the word "Void" (in ***bold and italic*** font style) in a single paragraph replacing the field identifier.

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-ConfigurationSIB ::=          SEQUENCE {
    rootSequenceIndex                   INTEGER (0..1023),
    prach-ConfigInfo                    PRACH-ConfigInfo
}

PRACH-Configuration ::=             SEQUENCE {
    rootSequenceIndex                   INTEGER (0..1023),
    prach-ConfigInfo                    PRACH-ConfigInfo                    OPTIONAL    -- Need ON
}

PRACH-ConfigInfo ::=                SEQUENCE {
    prach-ConfigurationIndex            ENUMERATED {ffs},
    highSpeedFlag                       ENUMERATED {ffs},
    zeroCorrelationZoneConfig           ENUMERATED {ffs}
}

-- ASN1STOP
```

A group of closely related IE type definitions, like the IEs *PRACH-ConfigurationSIB* and *PRACH-Configuration* in this example, can preferably be 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-Configuration*" 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 (cf. 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-ConfigurationSIB* and *PRACH-Configuration* in the example above).

NOTE: Referring to an IE type, which 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, shall 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. 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

PreambleInformation ::=             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-Configuration ::=             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 shall include the keyword "Need", followed by one of the predefined semantics tags (OP, ON or OD) defined in sub-clause 6.1. If the semantics tag OP is used, the semantics of the absent field may be 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 shall include 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.

If the ASN.1 section does not include any fields with conditional presence, the conditional presence table shall not be included.

A.4 Extension of the PDU specifications

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 intergrity protection after security activation

A - C…Messages that can be sent unciphered after security activation

NA… Message can never be sent after security activation

Message	P	A-I	A-C	Comment
DLInformationTransfer	**+**	**-**	**-**	
HandoverFromEUTRAPreparationRequest (CDMA2000)	**-**	**-**	**-**	
MasterInformationBlock	**+**	**+**	**+**	
MeasurementReport	**+**	**-**	**-**	**Justification for case "P": RAN2 agreed that measurement configuration may be sent prior to security activation**
MobilityFromEUTRACommand	**-**	**-**	**-**	
Paging	**+**	**+**	**+**	
RRCConnectionReconfiguration	**+**	**-**	**-**	**The message shall not be sent unprotected before security activation if it is used to perform handover or to establish SRB2 and DRBs**
RRCConnectionReconfigurationComplete	**+**	**-**	**-**	**Unprotected, if sent as response to RRCConnectionReconfiguration which was sent before security activation**
RRCConnectionReestablishment	**-**	**+**	**+**	**This message is not protected by PDCP operation.**
RRCConnectionReestablishmentComplete	**-**	**-**	**-**	
RRCConnectionReestablishmentReject	**-**	**+**	**+**	**One reason to send this may be that the security context has been lost, therefore sent as unprotected.**
RRCConnectionReestablishmentRequest	**-**	**-**	**+**	**This message is not protected by PDCP operation. However a short MAC-I is included.**
RRCConnectionReject	**+**	**NA**	**NA**	
RRCConnectionRelease	**+**	**-**	**-**	**Jusitification for P: If the RRC connection only for signalling not requiring DRBs or encrypted messages, or the signalling connection has to be released prematurily, this message is sent as unprotected.**
RRCConnectionRequest	**+**	**NA**	**NA**	
RRCConnectionSetup	**+**	**NA**	**NA**	
RRCConnectionSetupComplete	**+**	**NA**	**NA**	
SecurityModeCommand	**+**	**NA**	**NA**	**Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC)**
SecurityModeComplete	**-**	**NA**	**NA**	**Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure.**
SecurityModeFailure	**+**	**NA**	**NA**	**Neither integrity protection nor ciphering applied.**
SystemInformation	**+**	**+**	**+**	
SystemInformationBlockType1	**+**	**+**	**+**	
UECapabilityEnquiry	**+**	**-**	**-**	
UECapabilityInformation	**+**	**-**	**-**	
ULHandoverPreparationTransfer (CDMA2000)	**-**	**-**	**-**	**This message should follow HandoverFromEUTRAPreparationRequest**
ULInformationTransfer	**+**	**-**	**-**	

Annex B (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

History

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