3GPP TSG-RAN WG2 Meeting #72
Jacksonville, US, 15- 19 Nov 2010

⌘ ***R2-106856***

CR-Form-v9.6

CHANGE REQUEST

⌘ **36.331** **CR** **0488** ⌘**rev** **1** ⌘ Current version: **9.4.0** ⌘

*For **HELP** on using this form look at the pop-up text over the ⌘ symbols. Comprehensive instructions on how to use this form can be found at http://www.3gpp.org/specs/CR.htm.*

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☒ Core Network ☐

Title: ⌘ Introduction of Carrier Aggregation and UL/ DL MIMO

Source to WG: ⌘ Rapporteur (Samsung)

Source to TSG: ⌘ RAN2

Work item code: ⌘ LTE_CA-Core, LTE_UL_MIMO-Core, LTE_eDL_MIMO-Core ***Date:*** ⌘ November 2010

Category: ⌘ **B** ***Release:*** ⌘ REL-10

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)
Rel-8 (Release 8)
Rel-9 (Release 9)
Rel-10 (Release 10)

Reason for change: ⌘ The CR aims to capture the RAN2 agreements regarding Carrier Aggregation

Summary of change: ⌘ The CR includes the following changes (to be completed)

- System information
  - Transfer of system information for secondary cells by dedicated signalling, upon secondary cell addition (also covers system information change)
- Connection control
  - Introduction of secondary cell addition, modification and release. While change to another primary cell requires handover, changing the set of secondary cells can be done with a reconfiguration not including MCI
  - Upon handover, source selects target primary cell and provides a list of candidate cells. For the candidate cells, the source may also provide available measurement information. The target decides which secondary cell to configure. Following handover, the initial state of secondary cells is 'deactivated'.
  - Secondary cells are not configured during establishment. Upon re-establishment secondary cells are released (may be added again upon subsequent reconfiguration)
  - Physical layer monitoring is performed for the primary cell only
- Measurements
  - Generalisation of events A1, A2 i.e. they may also be applied on a secondary frequency. Introduction of a new event A6 for comparison of a secondary cell with neighbouring cells on the concerned secondary frequency
  - Swapping of measurement objects upon change of primary cell to another frequency
  - Use of primary cell as reference for s-Measure, affecting all measurements
  - Autonomous removal of measIds of measurements involving a serving cell that are linked to an object that does not concern a serving frequency
  - A measurement report always includes all serving cells (primary and secondary)

Commented [H1]: Document numbers are allocated by the Working Group Secretary. Use the format of document number specified by the 3GPP Working Procedures.

Commented [H2]: Enter the specification number in this box. For example, 04.08 or 31.102. Do not prefix the number with anything . i.e. do not use "TS", "GSM" or "3GPP" etc.

Commented [H3]: Enter the CR number here. This number is allocated by the 3GPP support team. It consists of at least four digits, padded with leading zeros if necessary.

Commented [H4]: Enter the revision number of the CR here. If it is the first version, use a "-".

Commented [H5]: Enter the version of the specification here. This number is the version of the specification to which the CR was written and (normally) to which it will be applied if it is approved. Make sure that the latest version of the specification (of the relevant release) is used when creating the CR. If unsure what the latest version is, go to http://www.3gpp.org/specs/specs.htm.

Commented [H6]: For help on how to fill out a field, place the mouse pointer over the special symbol closest to the field in question.

Commented [H7]: Mark one or more of the boxes with an X.

Commented [H8]: SIM / USIM / ISIM applications.

Commented [H9]: Enter a concise description of the subject matter of the CR. It should be no longer than one line, but if this is not possible, do not enter hard new-line characters. Do not use redundant information such as "Change Request number xxx to 3GPP TS xx.xxx".

Commented [H10]: One or more organizations (3GPP Individual Members) which drafted the CR and are presenting it to the Working Group.

Commented [H11]: For CRs agreed at Working Group level, the identity of the WG. Use the format "xn" where
→ x = "C" for TSG CT, "R" for TSG RAN, "S" for TSG SA, "G" for for TSG GERAN;
→ n = digit identifying the Working Group; for CRs drafted during the TSG meeting itself, use "P".
Examples: "C4", "R5", "G3new", "SP".

Commented [H12]: Enter the acronym for the work item which is applicable to the change. This field is mandatory for category F, A, B & C CRs for Release 4 and later. A list of work item acronyms can be found in the 3GPP work plan. See http://www.3gpp.org/ftp/Specs/html-info/WI-List.htm .

Commented [H13]: Enter the date on which the CR was last revised. Format to be interpretable by English version of MS Windows ® applications, e.g. 19/02/2006.

Commented [H14]: Enter a single letter corresponding to the most appropriate category listed. For more detailed help on interpreting these categories, see Technical Report 21.900 "TSG working methods".

Commented [H15]: Enter a single release code from the list below.

Commented [H16]: Enter text which explains why the change is necessary.

Commented [H17]: Enter text which describes the most important components of the change. i.e. How the change is made.

	• PDUs/ Configuration parameters •Introduction of top level fields within the reconfiguration message to support addition/ modification and release of secondary cells, including a cell index. ○ Introduction of cell specific and UE-specific secondary cell configuration parameters ○ Secondary cell information is structured to reflect that the uplink may not be configured ○ Delta signalling is supported upon modification of an existing secondary cell, but not upon addition or upon handover •Introduction, at the default extension location, of new configuration parameters applicable for the primary cell/ common value applicable for all cells
Consequences if not approved:	⌘ RAN2 agreements regarding Carrier Aggregation are not captured in 36.331

Clauses affected:	⌘			
Other specs affected:	⌘	**Y**	**N**	
		X		Other core specifications ⌘
		X		Test specifications
		X		O&M Specifications
Other comments:	⌘ Agreements regarding UE capability changes related to Carrier Aggregation and UL/ DL MIMO will be captured in a separate CR (R2-106934 CR0528r).			

Commented [H18]: Enter here the consequences if this CR were to be rejected. It is mandatory to complete this section only if the CR is of category "F" (i.e. correction), though it may well be useful for other categories.

Commented [H19]: Enter the number of each clause which contains changes. Be as specific as possible (ie list each subclause, not just the umbrella clause).

Commented [H20]: Tick "yes" box if any other specifications are affected by this change. Else tick "no". You MUST fill in one or the other.

Commented [H21]: List here the specifications which are affected or the CRs which are linked.

Commented [H22]: Enter any other information which may be needed by the group being requested to approve the CR. This could include special conditions for it's approval which are not listed anywhere else above.

3.1 Definitions

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

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

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

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

Primary Cell: the cell, operating on the primary frequency, in which the UE either performs the initial connection establishment procedure or initiates the connection re-establishment procedure, or the cell indicated as the primary cell in the handover procedure.

Secondary Cell: a cell, operating on a secondary frequency, which may be configured once an RRC connection is established and which may be used to provide additional radio resources.

Serving Cell: For a UE in RRC_CONNECTED not configured with CA or not capable of CA there is only one serving cell comprising of the primary cell. For a UE in RRC_CONNECTED configured with CA the term 'serving cells' is used to denote the set of one or more cells comprising of the primary cell and all secondary cells.

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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 One
ARQ	Automatic Repeat Request
AS	Access Stratum
BCCH	Broadcast Control Channel
BCH	Broadcast Channel
CA	Carrier Aggregation
CCCH	Common Control Channel
CCO	Cell Change Order
CMAS	Commercial Mobile Alert Service
CP	Control Plane
C-RNTI	Cell RNTI
CSG	Closed Subscriber Group
DCCH	Dedicated Control Channel
DRB	(user) Data Radio Bearer
DRX	Discontinuous Reception
DTCH	Dedicated Traffic Channel
DL	Downlink
DL-SCH	Downlink Shared Channel
ETWS	Earthquake and Tsunami Warning System
E-UTRA	Evolved Universal Terrestrial Radio Access
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
ENB	Evolved Node B
EPC	Enhanced Packet Core
EPS	Enhanced Packet System
FDD	Frequency Division Duplex
FFS	For Further Study
GERAN	GSM/EDGE Radio Access Network
GSM	Global System for Mobile Communications
HARQ	Hybrid Automatic Repeat Request
HRPD	CDMA2000 High Rate Packet Data
IE	Information element

IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
kB	Kilobyte (1000 bytes)
L1	Layer 1
L2	Layer 2
L3	Layer 3
MAC	Medium Access Control
MBMS	Multimedia Broadcast Multicast Service
MBSFN	Multimedia Broadcast multicast service Single Frequency Network
MIB	Master Information Block
MRB	MBMS Point to Multipoint Radio Bearer
MSI	MCH Scheduling Information
N/A	Not Applicable
NACC	Network Assisted Cell Change
NAS	Non Access Stratum
PCCH	Paging Control Channel
PCell	Primary Cell
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
SCell	Secondary Cell
SFN	System Frame Number
SI	System Information
SIB	System Information Block
SI-RNTI	System Information RNTI
SPS	Semi-Persistent Scheduling
SRB	Signalling Radio Bearer
SSAC	Service Specific Access Control
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

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4.2.1 UE states and state transitions including inter RAT

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

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

    Monitors control channels associated with the shared data channel to determine if data is scheduled for it;
    - Provides channel quality and feedback information;
    - Performs neighbouring cell measurements and measurement reporting;
    - Acquires system information.

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

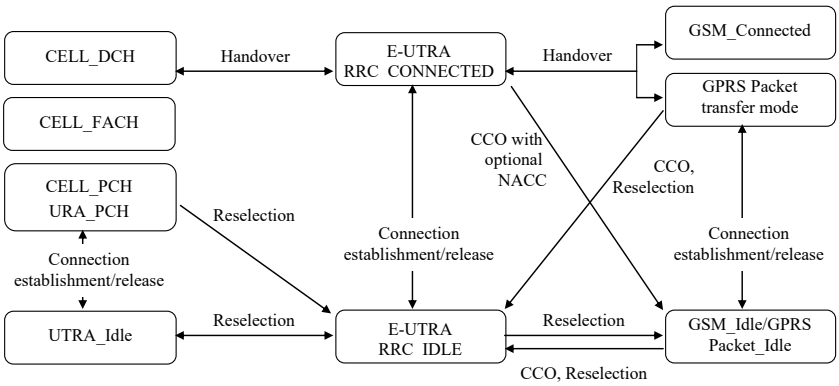

Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP

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

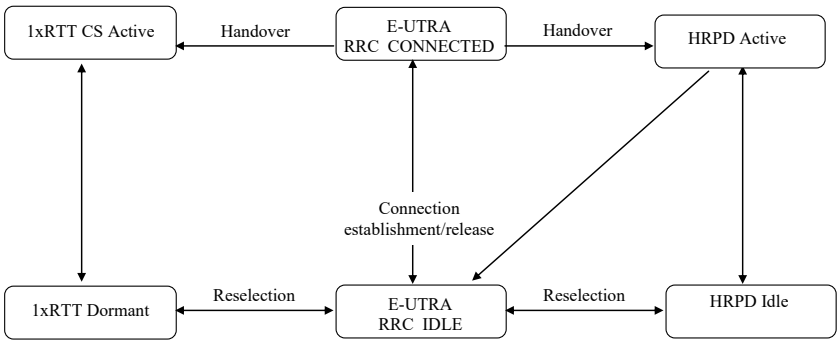

Figure 4.2.1-2: Mobility procedures between E-UTRA and CDMA2000

The inter-RAT handover procedure(s) supports the case of signalling, conversational services, non-conversational services and combinations of these.

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

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5.2.1.1 General

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

The UE applies the system information acquisition and change monitoring procedures for the PCell only. For SCells, E-UTRAN provides, to a UE supporting CA, all system information relevant for operation in the concerned cell in RRC_CONNECTED via dedicated signalling when adding a SCell. For SCells, change of system information is handled by release and addition of the concerned SCell, which may be done with a single *RRCConnectionReconfiguration* message.

NOTE: E-UTRAN may signal via dedicated signalling different parameter values than broadcast in the concerned SCell.

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5.2.2.4 System information acquisition by the UE

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1;

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

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

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

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

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

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

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

2> upon acquiring the concerned system information:

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

1> following a request from CDMA2000 upper layers:

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

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

1> if the UE is ETWS capable:

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

3> discard any previously buffered *warningMessageSegment*;

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

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

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

4> start acquiring *SystemInformationBlockType10* immediately;

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

4> start acquiring *SystemInformationBlockType11* immediately;

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

1> if the UE is CMAS capable:

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

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* associated with the discarded *warningMessageSegment* ;

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

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

4> aquire *SystemInformationBlockType12*;

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NOTE 3: UEs shall start acquiring *SystemInformationBlockType12* as described above even when *systemInfoValueTag* in *SystemInformationBlockType1* has not changed.

1> if the UE is interested to receive MBMS services; and

1> if *schedulingInfoList* indicates that *SystemInformationBlockType13* is present and the UE does not have stored a valid version of this system information block:

2> aquire *SystemInformationBlockType13*;

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

NOTE 4: While attempting to acquire a particular SIB, if the UE detects from *schedulingInfoList* that it is no longer present, the UE should stop trying to acquire the particular SIB.

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5.3 Connection control

5.3.1 Introduction

5.3.1.1 RRC connection control

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

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

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

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

After having initiated the initial security activation procedure, E-UTRAN may configure a UE that supports Carrier Aggregation, with one or more SCells in addition to the PCell that is initially configured during connection establishment. The PCell is used to provide the security inputs and upper layer system information (i.e. the NAS mobility information e.g. TAI). SCells are used to provide additional downlink and optionally uplink radio resources.

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

5.3.1.2 Security

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

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

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

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

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

NOTE 1: Lower layers discard RRC messages for which the integrity check has failed and indicate the integrity verification check failure to RRC.

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

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

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

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

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

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

5.3.1.3 Connected mode mobility

In RRC_CONNECTED, the network controls UE mobility, i.e. the network decides when the UE shall move to which (primary and optionally secondary) E-UTRA cell(s) or inter-RAT cell. For network controlled mobility in RRC_CONNECTED, handover is the only procedure that is defined. The network triggers the handover procedure e.g. based on radio conditions, load. To facilitate this, the network may configure the UE to perform measurement reporting (possibly including the configuration of measurement gaps). The network may also initiate handover blindly, i.e. without having received measurement reports from the UE.

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For UEs supporting CA, E-UTRAN can change the PCell only by means of the handover procedure using an *RRCConnectionReconfiguration* message including the *mobilityControlInfo*. E-UTRAN can independently add, remove or modify SCells by means of the RRC connection reconfiguration procedure using the *RRCConnectionReconfiguration* message, either including the *mobilityControlInfo* or not.

Before sending the handover message to the UE, the source eNB prepares one or more target cells. The source eNB selects the target PCell. The source eNB may also provide the target eNB with a list of cells, which includes the best

cell on each frequency for which measurement information is available, in order of decreasing RSRP. The source eNB may also include available measurement information for the cells provided in the list. The target eNB decides which SCells are configured for use after handover, which may include cells other than the ones indicated by the source eNB.

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(s). 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 PCell at the first available RACH occasion according to Random Access resource selection defined in TS 36.321 [6], i.e. the handover is asynchronous. Consequently, when allocating a dedicated preamble for the random access in the target PCell, 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.

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If the target eNB does not support the release of RRC protocol which the source eNB used to configure the UE, the target eNB may be unable to comprehend the UE configuration provided by the source eNB. In this case, the target eNB should use the full configuration option to reconfigure the UE for Handover and Re-establishment. Full configuration option includes an initialization of the radio configuration, which makes the procedure independent of the configuration used in the source cell with the exception that the security algorithms are continued for the RRC re-establishment.

After the successful completion of handover, PDCP SDUs may be re-transmitted in the target cell(s). This only applies for DRBs using RLC-AM mode and for handovers not involving full configuration option. The further details are specified in TS 36.323 [8]. After the successful completion of handover not involving full configuration option, the SN and the HFN are reset except for the DRBs using RLC-AM mode (for which both SN and HFN continue). For reconfigurations involving the full configuration option, the PDCP entities are newly established (SN and HFN do not continue) for all DRBs irrespective of the RLC mode. The further details are specified in TS 36.323 [8].

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

The source eNB should, for some time, maintain a context to enable the UE to return in case of handover failure. After having detected handover failure, the UE attempts to resume the RRC connection either in the source PCell 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. The cell in which the re-establishment procedure was initiated becomes the PCell while SCells, if configured, are released.

Normal measurement and mobility procedures are used to support handover to cells broadcasting a CSG identity. In addition, E-UTRAN may configure the UE to report that it is entering or leaving the proximity of cell(s) included in its CSG whitelist. Furthermore, E-UTRAN may request the UE to provide additional information broadcast by the handover candidate cell e.g. cell global identity, CSG identity, CSG membership status.

NOTE E-UTRAN may use the 'proximity report' to configure measurements as well as to decide whether or not to request additional information broadcast by the handover candidate cell. The additional information is used to verify whether or not the UE is authorised to access the target cell and may also be needed to identify handover candidate cell (*PCI confusion* i.e. when the physical layer identity that is included in the measurement report does not uniquely identify the cell).

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5.3.3.4 Reception of the *RRCConnectionSetup* by the UE

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

The UE shall:

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

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

1> stop timer T300;

1> stop timer T302, if running;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> perform the actions as specified in 5.3.3.7;

1> stop timer T320, if running;

1> enter RRC_CONNECTED;

1> stop the cell re-selection procedure;

1> consider the current cell to be the PCell;

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

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

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

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

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

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

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

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

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5.3.5 RRC connection reconfiguration

5.3.5.1 General

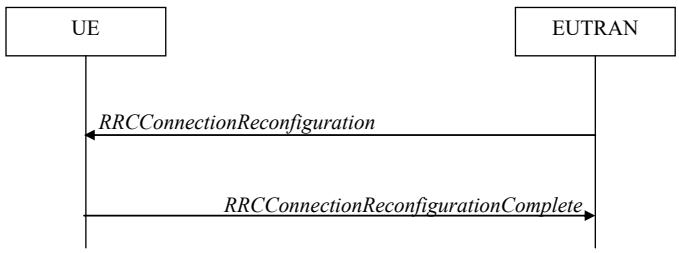

Figure 5.3.5.1-1: RRC connection reconfiguration, successful

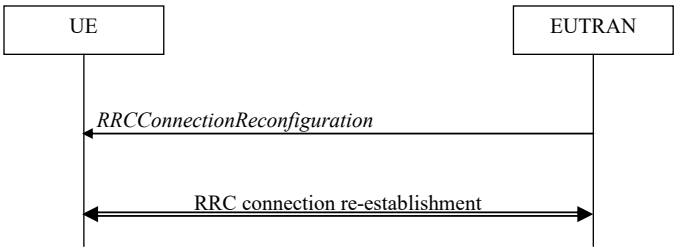

Figure 5.3.5.1-2: RRC connection reconfiguration, failure

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, to add/ modify/ release SCells. As part of the procedure, NAS dedicated information may be transferred from E-UTRAN to the UE.

5.3.5.2 Initiation

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

- the *mobilityControlInfo* is included only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;
- the establishment of RBs (other than SRB1, that is established during RRC connection establishment) is included only when AS security has been activated;
- the addition of SCells is performed only when AS security has been activated;

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

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

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

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

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

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

3> perform the radio configuration procedure as specified in section 5.3.5.8;

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

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

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

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

1> else:

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

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

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

1> if the received *RRCConnectionReconfiguration* includes the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.10.3a;

1> if the received *RRCConnectionReconfiguration* includes the *sCellToAddModList*:

2> perform SCell addition or modification as specified in 5.3.10.3b;

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

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

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

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

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

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

2> perform the proximity indication in accordance with the received *reportProximityConfig*;

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

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

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

1> stop timer T310, if running;

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

1> if the *carrierFreq* is included:

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

1> else:

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

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

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

1> reset MAC;

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

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

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

1> configure lower layers to consider the SCell(s), if configured, to be in deactivated state;

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

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

2> perform the radio configuration procedure as specified in section 5.3.5.8;

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

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

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

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

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

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

1> else:

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

1> store the *nextHopChainingCount* value;

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

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

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

1> else:

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

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

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

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

1> if the received *RRCConnectionReconfiguration* includes the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.10.3a;

1> if the received *RRCConnectionReconfiguration* includes the s*CellToAddModList*:

2> perform SCell addition or modification as specified in 5.3.10.3b;

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

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

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

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

1> release *reportProximityConfig* and clear any associated proximity status reporting timer;

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

2> perform the proximity indication in accordance with the received *reportProximityConfig*;

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

1> if MAC successfully completes the random access procedure:

2> stop timer T304;

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

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

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

2> the procedure ends;

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

5.3.5.5 Reconfiguration failure

The UE shall:

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

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

2> if security has not been activated:

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

2> else:

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

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

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

5.3.5.6 T304 expiry (handover failure)

The UE shall:

1> if T304 expires (handover failure):

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

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

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

5.3.5.7 Void

5.3.5.8 Radio Configuration involving full configuration option

The UE shall:

1> release/ clear all current dedicated radio configurations except the C-RNTI, the security configuration and the PDCP, RLC and logical channel configurations for the RBs;

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like *MeasConfig* and *OtherConfig*.

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

2> release/ clear all current common radio configurations;

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

1> else:

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SystemInformationBlockType2*;

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> for each *srb-Identity* value included in the *srb-ToAddModList* (SRB reconfiguration):

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

2> apply the corresponding default RLC configuration for the SRB specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;

2> apply the corresponding default logical channel configuration for the SRB as specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;

NOTE 2: This is to get the SRBs (SRB1 and SRB2 for handover and SRB2 for reconfiguration after reestablishment) to a known state from which the reconfiguration message can do further configuration.

1> for each *eps-BearerIdentity* value included in the *drb-ToAddModList* that is part of the current UE configuration:

2> release the PDCP entity;

2> release the RLC entity or entities;

2> release the DTCH logical channel;

2> release the *drb-identity*;

NOTE 3: This will retain the *eps-bearerIdentity* but remove the DRBs including *drb-identity* of these bearers from the current UE configuration and trigger the setup of the DRBs within the AS in Section 5.3.10.3 using the new configuration. The *eps-bearerIdentity* acts as the anchor for associating the released and re-setup DRB.

1> for each *eps-BearerIdentity* value that is part of the current UE configuration but not part of the *drb-ToAddModList:*

2> perform DRB release as specified in 5.3.10.2;

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5.3.7 RRC connection re-establishment

5.3.7.1 General

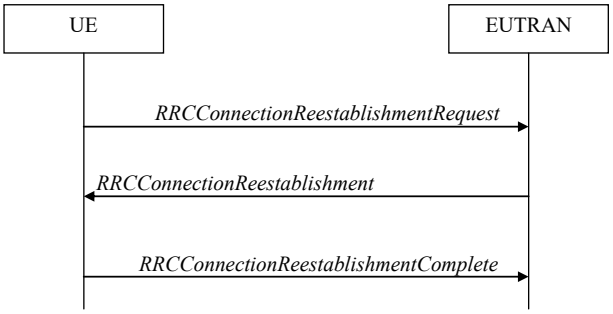

Figure 5.3.7.1-1: RRC connection re-establishment, successful

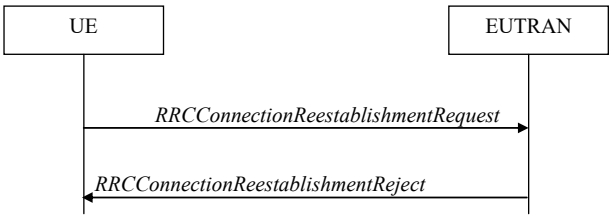

Figure 5.3.7.1-2: RRC connection re-establishment, failure

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

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

E-UTRAN applies the procedure as follows:

- to reconfigure SRB1 and to resume data transfer only for this RB;
- to re-activate AS security without changing algorithms.

5.3.7.2 Initiation

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

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

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

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

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

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

Upon initiation of the procedure, the UE shall:

1> stop timer T310, if running;

1> start timer T311;

1> suspend all RBs except SRB0;

1> reset MAC;

1> release the SCell(s), if configured, in accordance with 5.3.10.3a;

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> release *reportProximityConfig* and clear any associated proximity status reporting timer;

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

5.3.7.3 Actions following cell selection while T311 is running

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

1> stop timer T311;

1> start timer T301;

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

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

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

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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 PCell (handover and mobility from E-UTRA failure) or used in the PCell in which the trigger for the re-establishment occurred (other cases);

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

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

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

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

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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> consider the current cell to be the PCell;

1> re-establish PDCP for SRB1;

1> re-establish RLC for SRB1;

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

1> resume SRB1;

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

1> store the *nextHopChainingCount* value;

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

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

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

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

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

2> include the *rlf-InfoAvailable* and set it to *true*, if the UE has radio link failure information available that is related to the last occurrence of radio link failure;

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

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

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

5.3.7.6 T311 expiry

Upon T311 expiry, the UE shall:

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

5.3.7.7 T301 expiry or selected cell no longer suitable

The UE shall:

1> if timer T301 expires; or

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

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

5.3.7.8 Reception of *RRCConnectionReestablishmentReject* by the UE

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

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

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5.3.9 RRC connection release requested by upper layers

5.3.9.1 General

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

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

5.3.9.2 Initiation

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

The UE shall:

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

1> if the upper layers indicate barring of the PCell:

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

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5.3.10 Radio resource configuration

5.3.10.0 General

The UE shall:

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

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

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

2> perform DRB release as specified in 5.3.10.2;

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

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

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

2> perform MAC main reconfiguration as specified in 5.3.10.4;

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

2> perform SPS reconfiguration according to 5.3.10.5;

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

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

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

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

5.3.10.1 SRB addition/ modification

The UE shall:

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

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

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

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

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

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

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

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

5.3.10.2 DRB release

The UE shall:

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

1> for each *drb-identity* value that is to be released as the result of full configuration option according to 5.3.5.8:

2> release the PDCP entity;

2> release the RLC entity or entities;

2> release the DTCH logical channel;

1> if the procedure was triggered due to handover:

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

1> else:

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

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

5.3.10.3 DRB addition/ modification

The UE shall:

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

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

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

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

1> if the *RRCConnectionReconfiguration* message includes the *fullConfig* IE:

2> associate the established DRB with corresponding included *eps-BearerIdentity*;

1> else:

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

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

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

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

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

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

2> if the *logicalChannelConfig* is included:

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

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

5.3.10.3a SCell release

The UE shall:

1> if the release is triggered by reception of the *sCellToReleaseList*:

2> for each *sCellIndex* value included in the *sCellToReleaseList*:

3> if the current UE configuration includes an SCell with value *sCellIndex*:

4> release the SCell;

1> if the release is triggered by RRC connection re-establishment:

2> release all SCells that are part of the current UE configuration;

5.3.10.3b SCell addition/ modification

The UE shall:

1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the *cellIdentification*, in accordance with the received *radioResourceConfigCommon* and *radioResourceConfigDedicated*;

2> configure lower layers to consider the SCell to be in deactivated state;

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the received *radioResourceConfigDedicated*;

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5.3.11 Radio link failure related actions

5.3.11.1 Detection of physical layer problems in RRC_CONNECTED

The UE shall:

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

2> start timer T310;

NOTE: Physical layer monitoring and related autonomous actions do not apply to SCells.

5.3.11.2 Recovery of physical layer problems

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

1> stop timer T310;

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

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

5.3.11.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry; or

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

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

2> consider radio link failure to be detected;

2> if AS security has not been activated:

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

2> else:

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

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5.3.13 UE actions upon PUCCH/ SRS release request

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

1> apply the default physical channel configuration for *CQI-ReportConfig* and *cqi-Mask* if configured as specified in 9.2.4;

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

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

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5.4 Inter-RAT mobility

5.4.1 Introduction

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

For the (network controlled) inter RAT mobility from E-UTRA for a UE in RRC_CONNECTED, a single procedure is defined that supports both handover, cell change order with optional network assistance (NACC) and enhanced CS fallback to CDMA2000 1xRTT. In case of mobility to CDMA2000, the eNB decides when to move to the other RAT while the target RAT determines to which cell the UE shall move.

5.4.2 Handover to E-UTRA

5.4.2.1 General

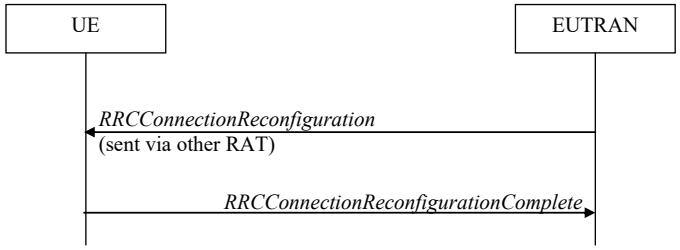

Figure 5.4.2.1-1: Handover to E-UTRA, successful

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

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

5.4.2.2 Initiation

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

E-UTRAN applies the procedure as follows:

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

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

5.4.2.3 Reception of the *RRCConnectionReconfiguration* by the UE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1> if the received *RRCConnectionReconfiguration* includes the s*CellToAddModList*:

2> perform SCell addition as specified in 5.3.10.3b;

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

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

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

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

2> perform the proximity indication configuration in accordance with the received *reportProximityConfig*;

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

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1> if the *RRCConnectionReconfiguration* message does not include the *rlf-TimersAndConstants*:

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

1> if MAC successfully completes the random access procedure:

2> stop timer T304;

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

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

NOTE 1: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

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

NOTE 2: The UE is not required to determine the SFN of the target PCell by acquiring system information from that cell before performing RACH access in the target PCell.

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5.4.2.4 Reconfiguration failure

The UE shall:

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

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

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

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

5.4.2.5 T304 expiry (handover to E-UTRA failure)

The UE shall:

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

2> reset MAC;

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

5.4.3 Mobility from E-UTRA

5.4.3.1 General

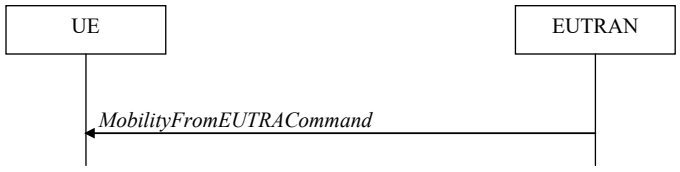

Figure 5.4.3.1-1: Mobility from E-UTRA, successful

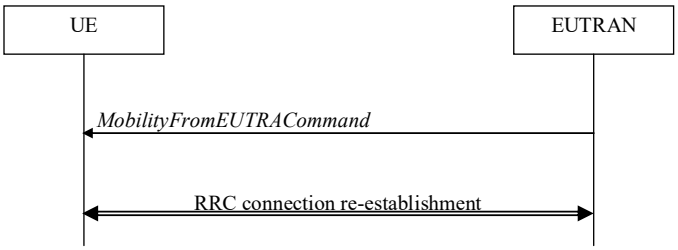

Figure 5.4.3.1-2: Mobility from E-UTRA, failure

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

- handover, i.e. the *MobilityFromEUTRACommand* message includes radio resources that have been allocated for the UE in the target cell;
- cell change order, i.e. the *MobilityFromEUTRACommand* message may include information facilitating access of and/ or connection establishment in the target cell, e.g. system information. Cell change order is applicable only to GERAN; and
- enhanced CS fallback to CDMA2000 1xRTT, i.e. the *MobilityFromEUTRACommand* message includes radio resources that have been allocated for the UE in the target cell. The enhanced CS fallback to CDMA2000 1xRTT may be combined with concurrent handover or redirection to CDMA2000 HRPD.

5.4.3.2 Initiation

E-UTRAN initiates the mobility from E-UTRA procedure to a UE in RRC_CONNECTED, possibly in response to a *MeasurementReport* message or in response to reception of CS fallback indication for the UE from MME, by sending a *MobilityFromEUTRACommand* message. E-UTRAN applies the procedure as follows:

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

5.4.3.3 Reception of the *MobilityFromEUTRACommand* by the UE

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

The UE shall:

1> stop timer T310, if running;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3> else:

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

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

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

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

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

1> if the *MobilityFromEUTRACommand* message includes the *purpose* set to '*e-CSFB*':

2> if *messageContCDMA2000-1XRTT* is present:

3> forward the *messageContCDMA2000-1XRTT* to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specification of the target RAT;

2> if *mobilityCDMA2000-HRPD* is present and is set to '*handover*':

3> forward the *messageContCDMA2000-HRPD* to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specification of the target RAT;

2> if *mobilityCDMA2000-HRPD* is present and is set to ' *redirection*':

3> forward the *redirectedCarrierInfoCDMA2000-HRPD* to the CDMA2000 upper layers;

NOTE 4: When the CDMA2000 upper layers in the UE receive both the *messageContCDMA2000-1XRTT* and *messageContCDMA2000-HRPD* the UE performs concurrent access to both CDMA2000 1xRTT and CDMA2000 HRPD RAT.

5.4.3.4 Successful completion of the mobility from E-UTRA

Upon successfully completing the handover, the cell change order or enhanced 1xRTT CS fallback, the UE shall:

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

1> stop timer T304, if running;

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

5.4.3.5 Mobility from E-UTRA failure

The UE shall:

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

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

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

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

2> stop T304, if running;

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

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

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

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

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

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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.

eNote The definitions of intra- and inter-frequency measurements for the case the UE is configured with SCells (CA) are FFS.

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

The measurement configuration includes the following parameters:

1. **Measurement objects:** The objects on which the UE shall perform the measurements.
   - For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets and a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.

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- 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.

NOTE 1: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, PCell UE Rx- Tx time difference.

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2. **Reporting configurations**: A list of reporting configurations where each reporting configuration consists of the following:
   - Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
   - Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).
3. **Measurement identities**: A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.
4. **Quantity configurations:** One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity.
5. **Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

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

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

The measurement procedures distinguish the following types of cells:

1. The serving cell(s)– these are the PCell and one or more SCells, if configured for a UE supporting CA.
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(s), listed cells and detected cells. For inter-RAT UTRA, the UE measures and reports on listed cells and optionally on cells that are within a range for which reporting is allowed by E-UTRAN. 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 2: For inter-RAT UTRA and CDMA2000, the UE measures and reports also on detected cells for the purpose of SON.

NOTE 3: This specification is based on the assumption that typically CSG cells of home deployment type are not indicated within the neighbour list. Furthermore, the assumption is that for non-home deployments, the physical cell identity is unique within the area of a large macro cell (i.e. as for UTRAN).

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

5.5.2 Measurement configuration

5.5.2.1 General

E-UTRAN applies the procedure as follows:

- to ensure that, whenever the UE has a *measConfig*, it includes a *measObject* for each serving frequency;
- to configure at most one measurement identity using a reporting configuration with the *purpose* set to '*reportCGI*';

The UE shall:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5.5.2.2 Measurement identity removal

The UE shall:

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

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

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

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

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

5.5.2.2a Measurement identity autonomous removal

The UE shall:

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

2> if the associated *reportConfig* concerns an event involving a serving cell while the concerned serving cell is not configured:

3> remove the *measId* from the *measIdList* within the *VarMeasConfig*;

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

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

NOTE 1: The above UE autonomous removal of *measId*'s applies only for measurement events A1, A2 and A6.

NOTE 2: When performed during re-establishment, the UE is only configured with a primary frequency (i.e. it released the SCells).

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5.5.3 Performing measurements

5.5.3.1 General

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

The UE shall:

1> whenever the UE has a *measConfig*, perform RSRP and RSRQ measurements for each serving cell;

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

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

3> if *si-RequestForHO* is configured for the associated *reportConfig*:

4> perform the corresponding measurements on the frequency and RAT indicated in the associated *measObject* using autonomous gaps as necessary;

3> else:

4> perform the corresponding measurements on the frequency and RAT indicated in the associated *measObject* using available idle periods or using autonomous gaps as necessary;

NOTE 1: If autonomous gaps are used to perform measurements, the UE is allowed to temporarily abort communication with all serving cells, i.e. create autonomous gaps to perform the corresponding measurements within the limits specified in TS 36.133 [16]. Otherwise, the UE only supports the measurements with the purpose set to '*reportCGI*' only if E-UTRAN has provided sufficient idle periods.

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

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

4> try to acquire the CSG identity, if the CSG identity is broadcast in the concerned cell;

4> if *si-RequestForHO* is not configured for the associated *reportConfig*:

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

NOTE 2: The 'primary' PLMN is part of the global cell identity.

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 list of additional PLMN Identities, if multiple PLMN identities are broadcast in the concerned cell;

4> try to acquire the CSG identity, if the CSG identity is 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;

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

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

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

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

2> else:

3> if a measurement gap configuration is setup; or

3> if the UE does not require measurement gaps to perform the concerned measurements:

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

4> if *s-Measure* is configured and the PCell RSRP, after layer 3 filtering, is lower than this value:

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

4> if the *ue-RxTxTimeDiffPeriodical* is configured in the associated *reportConfig*:

5> perform the UE Rx – Tx time difference measurements on the PCell;

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

NOTE 3: The '*s-Measure*' defines when the UE is required to perform measurements. The UE is however allowed to perform measurements also when the PCell RSRP exceeds '*s-Measure*', e.g., to measure cells broadcasting a CSG identity following use of the autonomous search function as defined in TS 36.304 [4].

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5.5.3.2 Layer 3 filtering

The UE shall:

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

NOTE 1: This does not include quantities configured solely for UE Rx- Tx time difference measurements i.e. for those type of measurements the UE ignores the *triggerQuantity* and *reportQuantity*.

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

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

where

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

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

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

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

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

NOTE 2: If k is set to 0, no layer 3 filtering is applicable.

NOTE 3: The filtering is performed in the same domain as used for evaluation of reporting criteria or for measurement reporting, i.e., logarithmic filtering for logarithmic measurements.

NOTE 4: The filter input rate is implementation dependent, to fulfil the performance requirements set in [16]. For further details about the physical layer measurements, see TS 36.133 [16].

5.5.4 Measurement report triggering

5.5.4.1 General

The UE shall:

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

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

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

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

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

2> else:

3> if the corresponding *measObject* concerns E-UTRA:

4> if the *ue-RxTxTimeDiffPeriodical* is configured in the corresponding *reportConfig*:

5> consider only the PCell to be applicable;

4> else if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:

Deleted: *ue-RxTxTimeDiffPeriodical*,

5> consider only the serving cell to be applicable;

4> else:

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

5> for events involving a serving cell on one frequency and neighbours on another frequency, the UE considers the serving cell on the other frequency as any other neighbouring cell;

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3> else if the corresponding *measObject* concerns UTRA or CDMA2000:

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

NOTE 0: The UE may also consider a neighbouring cell on the associated UTRA frequency to be applicable when the concerned cell is included in the *csg-allowedReportingCells* within the *VarMeasConfig* for this *measId*, if configured in the corresponding *measObjectUTRA* (i.e. the cell is included in the range of physical cell identities for which reporting is allowed).

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

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

2> if the *triggerType* is set to '*event*' and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include an measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

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

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

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

2> if the *triggerType* is set to '*event*' and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

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

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

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

2> if the *triggerType* is set to '*event*' and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

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

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration or if *a6-ReportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

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

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

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

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

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

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

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

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

NOTE 1: If the *purpose* is set to '*reportStrongestCells*', the UE initiates a first measurement report immediately after the quantity to be reported becomes available for at least either all serving cells or one of the applicable cells. If the purpose is set to '*reportStrongestCellsForSON*', the UE initiates a first measurement report when it has determined the strongest cells on the associated frequency.

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

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

2> if the *purpose is* included and set to '*reportCGI*' and if the UE acquired the information needed to set all fields of *cgi-Info* for the requested cell:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

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

3> stop timer T321;

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

2> upon expiry of the T321 for this *measId*:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

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

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

NOTE 2: The UE does not stop the periodical reporting with *triggerType* set to '*event*' or to '*periodical*' while the corresponding measurement is not performed due to the PCell RSRP being equal to or better than *s-Measure* or due to the measurement gap not being setup.

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NOTE 3: If the UE is configured with DRX, the UE may delay the measurement reporting for event triggered and periodical triggered measurements until the Active Time, which is defined in TS 36.321 [6].

5.5.4.2 Event A1 (Serving becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A1-2, as specified below, is fulfilled;

1> for this measurement, consider the (primary or secondary) cell that is configured on the frequency indicated in the associated *measObjectEUTRA* to be the serving cell;

Inequality A1-1 (Entering condition)

$Ms - Hys > Thresh$

Inequality A1-2 (Leaving condition)

$Ms + Hys < Thresh$

The variables in the formula are defined as follows:

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

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

Thresh is the threshold parameter for this event (i.e. *a1-Threshold* as defined within *reportConfigEUTRA* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Hys is expressed in dB.

Thresh is expressed in the same unit as ***Ms***.

5.5.4.3 Event A2 (Serving becomes worse than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;

1> for this measurement, consider the (primary or secondary) cell that is configured on the frequency indicated in the associated *measObjectEUTRA* to be the serving cell;

Inequality A2-1 (Entering condition)

$$Ms + Hys < Thresh$$

Inequality A2-2 (Leaving condition)

$$Ms - Hys > Thresh$$

The variables in the formula are defined as follows:

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

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

Thresh is the threshold parameter for this event (i.e. *a2-Threshold* as defined within *reportConfigEUTRA* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Hys is expressed in dB.

Thresh is expressed in the same unit as ***Ms***.

5.5.4.4 Event A3 (Neighbour becomes offset better than PCell)

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The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

NOTE The cell(s) that triggers the event is on the frequency indicated in the associated *measObject* which may be different than the (primary) frequency used by the PCell.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

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$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the frequency specific offset of the frequency of the neighbour cell (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the PCell, not taking into account any offsets.

Ofp is the frequency specific offset of the primary frequency (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the primary frequency).

Ocp is the cell specific offset of the PCell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the primary frequency), and is set to zero if not configured for the PCell.

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

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigEUTRA* for this event).

Mn, Mp are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ofn, Ocn, Ofp, Ocp, Hys, Off are expressed in dB.

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5.5.4.5 Event A4 (Neighbour becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A4-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled;

Inequality A4-1 (Entering condition)

$Mn + Ofn + Ocn - Hys > Thresh$

Inequality A4-2 (Leaving condition)

$Mn + Ofn + Ocn + Hys < Thresh$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the frequency specific offset of the frequency of the neighbour cell (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

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

Thresh is the threshold parameter for this event (i.e. *a4-Threshold* as defined within *reportConfigEUTRA* for this event).

Mn is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ofn, Ocn, Hys are expressed in dB.

Thresh is expressed in the same unit as ***Ms***.

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

The UE shall:

1> consider the entering condition for this event to be satisfied when both conditions A5-1 and condition A5-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;

NOTE The cell(s) that triggers the event is on the frequency indicated in the associated *measObject* which may be different than the (primary) frequency used by the PCell.

Inequality A5-1 (Entering condition 1)

$$Mp + Hys < Thresh1$$

Inequality A5-2 (Entering condition 2)

$$Mn + Ofn + Ocn - Hys > Thresh2$$

Inequality A5-3 (Leaving condition 1)

$$Mp - Hys > Thresh1$$

Inequality A5-4 (Leaving condition 2)

$$Mn + Ofn + Ocn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Mp is the measurement result of the PCell, not taking into account any offsets.

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the frequency specific offset of the frequency of the neighbour cell (i.e. *offsetFreq* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

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

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

Thresh2 is the threshold parameter for this event (i.e. *a5-Threshold2* as defined within *reportConfigEUTRA* for this event).

Mn, Mp are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ofn, Ocn, Hys are expressed in dB.

Thresh1 is expressed in the same unit as ***Mp***.

Thresh2 is expressed in the same unit as ***Mn***.

5.5.4.6a Event A6 (Neighbour becomes offset better than SCell)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A6-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A6-2, as specified below, is fulfilled;

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1> for this measurement, consider the (secondary) cell that is configured on the frequency indicated in the associated *measObjectEUTRA* to be the serving cell;

NOTE The neighbour(s) is on the same frequency as the SCell i.e. both are on the frequency indicated in the associated *measObject*.

Inequality A6-1 (Entering condition)

$Mn + Ocn - Hys > Ms + Ocs + Off$

Inequality A6-2 (Leaving condition)

$Mn + Ocn + Hys < Ms + Ocs + Off$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

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

Ocs is the cell specific offset of the serving cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the serving frequency), and is set to zero if not configured for the serving cell.

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

Off is the offset parameter for this event (i.e. *a6-Offset* as defined within *reportConfigEUTRA* for this event).

Mn, Ms are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Ocn, Ocs, Hys, Off are 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> consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

$Mn + Ofn - Hys > Thresh$

Inequality B1-2 (Leaving condition)

$Mn + Ofn + Hys < Thresh$

The variables in the formula are defined as follows:

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, *pilotStrength* is divided by -2.

Ofn is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the neighbour inter-RAT cell).

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

Thresh is the threshold parameter for this event (i.e. *b1-Threshold* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b1-Threshold* is divided by -2.

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

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Ofn, Hys are expressed in dB.

Thresh is expressed in the same unit as ***Mn***.

5.5.4.8 Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2)

The UE shall:

1> for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;

1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$Mp + Hys < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$Mn + Ofn - Hys > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$Mp - Hys > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$Mn + Ofn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Mp is the measurement result of the PCell, not taking into account any offsets.

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA2000 measurement result, *pilotStrength* is divided by -2.

Ofn is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the inter-RAT neighbour cell).

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

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

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b2-Threshold2* is divided by -2.

Mp is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

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

Ofn, Hys are expressed in dB.

Thresh1 is expressed in the same unit as ***Mp***.

Thresh2 is expressed in the same unit as ***Mn***.

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5.5.5 Measurement reporting

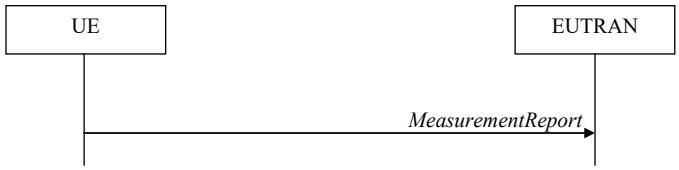

Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN.

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

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

1> set the *measResultPCell* to include the quantities of the PCell;

1> set the *measResultServFreqList* to include for each SCell that is configured, if any, within *measResultSCell* the quantities of the concerned SCell;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

2> for each serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:

3> set the *measResultServFreqList* to include within *measResultBestNeighCell* the *physCellId* and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency:

1> if there is at least one applicable neighbouring cell to report:

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

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

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

3> else:

4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *triggerType* is set to '*event*'; or the *purpose* is set to '*reportStrongestCells*' or to '*reportStrongestCellsForSON*':

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

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

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

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5> else:

6> set the *measResult* to the quantity as configured for the concerned RAT within the *quantityConfig* in order of either decreasing quantity for UTRA and GERAN or increasing quantity for CDMA2000 *pilotStrength*, i.e. the best cell is included first;

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

4> if the mandatory present fields of the *cgi-Info* for the cell indicated by the *cellForWhichToReportCGI* in the associated *measObject* have been obtained:

5> if the cell broadcasts a CSG identity:

6> include the *csg-Identity*;

6> include the *csg-MemberStatus* and set it to '*member*' if the CSG identity is included in the UE's CSG whitelist;

5> if the '*si-RequestForHO*' is configured within the *reportConfig* associated with this *measId*:

6> include the *cgi-Info* containing all the fields that have been successfully acquired, except for the *plmn-IdentityList*;

5> else:

6> include the *cgi-Info* containing all the fields that have been successfully acquired;

1> if the *ue-RxTxTimeDiffPeriodical* is configured within the corresponding *reportConfig* for this *measId*;

2> set the *ue-RxTxTimeDiffResult* to the measurement result provided by lower layers;

2> set the *currentSFN*;

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

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

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

1> else:

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

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

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the measured results are for CDMA2000 HRPD:

2> set the *preRegistrationStatusHRPD* to the UE's CDMA2000 upper layer's HRPD *preRegistrationStatus*;

1> if the measured results are for CDMA2000 1xRTT:

2> set the *preRegistrationStatusHRPD* to '*FALSE*';

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

5.5.6 Measurement related actions

5.5.6.1 Actions upon handover and re-establishment

E-UTRAN applies the handover procedure as follows:

- when performing the handover procedure, as specified in 5.3.5.4, ensure that a *measObjectId* corresponding to each handover target serving frequency is configured as a result of the procedures described in this sub-clause and in 5.3.5.4;

E-UTRAN applies the re-establishment procedure as follows:

- when performing the connection re-establishment procedure, as specified in 5.3.7, ensure that a *measObjectId* corresponding to each target serving frequency is configured as a result of the procedure described in this sub-clause and the subsequent connection reconfiguration procedure immediately following the re-establishment procedure;

The UE shall:

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

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

3> remove this *measId* from the *measIdList* within *VarMeasConfig*:

1> if the procedure was triggered due to a handover or successful re-establishment involving a change of the PCell to another frequency, update the *measId* values in the *measIdList* within *VarMeasConfig* as follows:

2> if a *measObjectId* value corresponding to the target primary frequency exists in the *measObjectList* within *VarMeasConfig*:

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

4> if the *measId* value is linked to the *measObjectId* value corresponding to the source primary frequency:

5> link this *measId* value to the *measObjectId* value corresponding to the target primary frequency;

4> else if the *measId* value is linked to the *measObjectId* value corresponding to the target primary frequency:

5> link this *measId* value to the *measObjectId* value corresponding to the source primary frequency;

2> else:

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

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

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

1> release the measurement gaps, if activated;

NOTE: If the UE requires measurement gaps to perform inter-frequency or inter-RAT measurements, the UE resumes the inter-frequency and inter-RAT measurements after the E-UTRAN has setup the measurement gaps.

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6.2.2 Message definitions

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– *MasterInformationBlock*

The *MasterInformationBlock* includes the system information transmitted on BCH.

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Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E-UTRAN to UE

MasterInformationBlock

```
-- ASN1START

MasterInformationBlock ::=          SEQUENCE {
    dl-Bandwidth                        ENUMERATED {
                                            n6, n15, n25, n50, n75, n100},
    phich-Config                        PHICH-Config,
    systemFrameNumber                   BIT STRING (SIZE (8)),
    spare                               BIT STRING (SIZE (10))
}


-- ASN1STOP
```

***MasterInformationBlock* field descriptions**
dl-Bandwidth Parameter: transmission bandwidth configuration, N_{RB} in downlink, see TS 36.101 [42, table 5.6-1]. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.
systemFrameNumber Defines the 8 most significant bits of the SFN. As indicated in TS 36.211 [21, 6.6.1], the 2 least significant bits of the SFN are acquired implicitly in the P-BCH decoding, i.e. timing of 40ms P-BCH TTI indicates 2 least significant bits (within 40ms P-BCH TTI, the first radio frame: 00, the second radio frame: 01, the third radio frame: 10, the last radio frame: 11). The (same) SFN value applies for all serving cells i.e. for the PCell as well as for SCells, if configured.

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– *RRCConnectionReconfiguration*

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

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

RRCConnectionReconfiguration message

```
-- ASN1START

RRCConnectionReconfiguration ::=    SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                                  CHOICE{
            rrcConnectionReconfiguration-r8     RRCConnectionReconfiguration-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture            SEQUENCE {}
    }
}

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
    measConfig                          MeasConfig                      OPTIONAL,   -- Need ON
```

```
    mobilityControlInfo                 MobilityControlInfo             OPTIONAL,   -- Cond HO
    dedicatedInfoNASList                SEQUENCE (SIZE(1..maxDRB)) OF
                                            DedicatedInfoNAS            OPTIONAL,   -- Cond nonHO
    radioResourceConfigDedicated        RadioResourceConfigDedicated    OPTIONAL, -- Cond HO-toEUTRA
    securityConfigHO                    SecurityConfigHO                OPTIONAL,   -- Cond HO
    nonCriticalExtension                RRCConnectionReconfiguration-v890-IEs   OPTIONAL
}

RRCConnectionReconfiguration-v890-IEs ::= SEQUENCE {
    lateNonCriticalExtension            OCTET STRING                    OPTIONAL,   -- Need OP
    nonCriticalExtension            RRCConnectionReconfiguration-v920-IEs       OPTIONAL
}

RRCConnectionReconfiguration-v920-IEs ::= SEQUENCE {
    otherConfig-r9                      OtherConfig-r9                  OPTIONAL,   -- Need ON
    fullConfig-r9                       ENUMERATED {true}               OPTIONAL,   -- Cond HO-
Reestab
    nonCriticalExtension                RRCConnectionReconfiguration-v10xy-IEs      OPTIONAL
}

RRCConnectionReconfiguration-v10xy-IEs ::= SEQUENCE {
    sCellToReleaseList-r10              SCellToReleaseList-r10          OPTIONAL,   -- Need ON
    sCellToAddModList-r10               SCellToAddModList-r10           OPTIONAL,   -- Need ON
    nonCriticalExtension                    SEQUENCE {}                     OPTIONAL    -- Need OP
}

SCellToAddModList-r10 ::=       SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-r10

SCellToAddMod-r10 ::=           SEQUENCE {
    sCellIndex-r10                      SCellIndex-r10,
    cellIdentification                  SEQUENCE {
        physCellId-r10                      PhysCellId,
        dl-CarrierFreq                      ARFCN-ValueEUTRA
    }                                                               OPTIONAL,   -- Cond SCellAdd
    radioResourceConfigCommon-r10       RadioResourceConfigCommonSCell-r10  OPTIONAL,   -- Cond
SCellAdd
    radioResourceConfigDedicated-r10    RadioResourceConfigDedicatedSCell-r10   OPTIONAL,   -- Cond
SCellAdd2
    ...
}

SCellToReleaseList-r10 ::=          SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellIndex-r10

SecurityConfigHO ::=                SEQUENCE {
    handoverType                        CHOICE {
        intraLTE                            SEQUENCE {
            securityAlgorithmConfig             SecurityAlgorithmConfig     OPTIONAL,   -- Cond
fullConfig
            keyChangeIndicator                  BOOLEAN,
            nextHopChainingCount                NextHopChainingCount
        },
        interRAT                            SEQUENCE {
            securityAlgorithmConfig             SecurityAlgorithmConfig,
            nas-SecurityParamToEUTRA            OCTET STRING (SIZE(6))
        }
    },
    ...
}


-- ASN1STOP
```

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RRCConnectionReconfiguration field descriptions
dedicatedInfoNASList This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for each PDU in the list.
nas-securityParamToEUTRA This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although it affects activation of AS- security after inter-RAT handover to E-UTRA. The content is defined in TS 24.301.
keyChangeIndicator 'true' is used only in an intra-cell handover when a K_{eNB} key is derived from a native K_{ASME} key taken into use through the successful NAS SMC, as described in TS 33.401 [32] for K_{eNB} re-keying. 'false' is used in an intra-LTE handover when the new K_{eNB} key is obtained from the current K_{eNB} key or from the NH as described in TS 33.401 [32].
nextHopChainingCount Parameter NCC: See TS 33.401 [32]
fullConfig Indicates the full configuration option is applicable for the RRC Connection Reconfiguration message.

Conditional presence	Explanation
HO	The field is mandatory present in case of handover within E-UTRA or to E-UTRA; otherwise the field is not present.
nonHO	The field is not present in case of handover within E-UTRA or to E-UTRA; otherwise it is optional present, need ON.
HO-toEUTRA	The field is mandatory present in case of handover to E-UTRA or for reconfigurations when *fullConfig* is included; otherwise the field is optionally present, need ON.
HO-Reestab	This field is optionally present, need ON, in case of handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment; otherwise the field is not present.
fullConfig	This field is mandatory present for handover within E-UTRA when the *fullConfig* is included; otherwise it is optionally present, Need OP.
SCellAdd	The field is mandatory present upon SCell addition; otherwise it is not present.
SCellAdd2	The field is mandatory present upon SCell addition; otherwise it is optionally present, need ON.

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– *RRCConnectionReestablishmentRequest*

The *RRCConnectionReestablishmentRequest* message is used to request the reestablishment of an RRC connection.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E-UTRAN

RRCConnectionReestablishmentRequest message

```
-- ASN1START

RRCConnectionReestablishmentRequest ::= SEQUENCE {
    criticalExtensions                CHOICE {
        rrcConnectionReestablishmentRequest-r8
                                            RRCConnectionReestablishmentRequest-r8-IEs,
        criticalExtensionsFuture            SEQUENCE {}
    }
}

RRCConnectionReestablishmentRequest-r8-IEs ::= SEQUENCE {
    ue-Identity                       ReestabUE-Identity,
    reestablishmentCause              ReestablishmentCause,
    spare                             BIT STRING (SIZE (2))
}
```

```
ReestabUE-Identity ::=              SEQUENCE {
    c-RNTI                              C-RNTI,
    physCellId                          PhysCellId,
    shortMAC-I                          ShortMAC-I
}

ReestablishmentCause ::=            ENUMERATED {
                                        reconfigurationFailure, handoverFailure,
                                        otherFailure, spare1}

-- ASN1STOP
```

***RRCConnectionReestablishmentRequest* field descriptions**
ue-Identity UE identity included to retrieve UE context and to facilitate contention resolution by lower layers.
reestablishmentCause Indicates the failure cause that triggered the re-establishment procedure.
physCellId The Physical Cell Identity of the PCell the UE was connected to prior to the failure.

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– *UEInformationResponse*

The *UEInformationResponse* message is used by the UE to transfer the information requested by the E-UTRAN.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

UEInformationResponse message

```
-- ASN1START

UEInformationResponse-r9    ::=         SEQUENCE {
    rrc-TransactionIdentifier           RRC-TransactionIdentifier,
    criticalExtensions                  CHOICE {
        c1                              CHOICE {
            ueInformationResponse-r9                UEInformationResponse-r9-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture                SEQUENCE {}
    }
}

UEInformationResponse-r9-IEs ::=        SEQUENCE {
    rach-Report-r9                          SEQUENCE {
        numberOfPreamblesSent-r9                INTEGER (1..200),
        contentionDetected-r9                   BOOLEAN
    }                                                           OPTIONAL,
    rlfReport-r9                            RLF-Report-r9       OPTIONAL,
    nonCriticalExtension                    UEInformationResponse-v930-IEs          OPTIONAL
}

UEInformationResponse-v930-IEs ::= SEQUENCE {
    lateNonCriticalExtension            OCTET STRING                        OPTIONAL,   -- Need OP
    nonCriticalExtension                SEQUENCE {}                         OPTIONAL    -- Need OP
}

RLF-Report-r9 ::=                   SEQUENCE {
    measResultLastServCell              SEQUENCE {
        rsrpResult                          RSRP-Range,
        rsrqResult                          RSRQ-Range          OPTIONAL
    },
    measResultNeighCells                SEQUENCE {
        measResultListEUTRA                 MeasResultList2EUTRA    OPTIONAL,
        measResultListUTRA                  MeasResultList2UTRA     OPTIONAL,
```

```
        measResultListGERAN                 MeasResultListGERAN     OPTIONAL,
        measResultsCDMA2000                 MeasResultList2CDMA2000 OPTIONAL
    }                                                               OPTIONAL,
    ...
}

MeasResultList2EUTRA ::=                SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {
    carrierFreq                         ARFCN-ValueEUTRA,
    measResultList                      MeasResultListEUTRA
}

MeasResultList2UTRA ::=             SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {
    carrierFreq                         ARFCN-ValueUTRA,
    measResultList                      MeasResultListUTRA
}

MeasResultList2CDMA2000 ::=         SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {
    carrierFreq                         CarrierFreqCDMA2000,
    measResultList                      MeasResultsCDMA2000
}

-- ASN1STOP
```

***UEInformationResponse* field descriptions**
numberOfPreamblesSent This field is used to indicate the number of RACH preambles that were transmitted. Corresponds to parameter PREAMBLE_TRANSMISSION_COUNTER in TS 36.321 [6].
contentionDetected This field is used to indicate that contention was detected for at least one of the transmitted preambles, see also [6].
measResultLastServCell This field refers to the last measurement results taken in the PCell, where radio link failure happened.

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6.3.2 Radio resource control information elements

– *AntennaInfo*

The IE *AntennaInfoCommon* and the *AntennaInfoDedicated* are used to specify the common and the UE specific antenna configuration respectively.

AntennaInfo information elements

```
-- ASN1START

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

AntennaInfoDedicated ::=            SEQUENCE {
    transmissionMode                    ENUMERATED {
                                            tm1, tm2, tm3, tm4, tm5, tm6,
                                            tm7, tm8-v920},
    codebookSubsetRestriction           CHOICE {
        n2TxAntenna-tm3                     BIT STRING (SIZE (2)),
        n4TxAntenna-tm3                     BIT STRING (SIZE (4)),
        n2TxAntenna-tm4                     BIT STRING (SIZE (6)),
        n4TxAntenna-tm4                     BIT STRING (SIZE (64)),
        n2TxAntenna-tm5                     BIT STRING (SIZE (4)),
        n4TxAntenna-tm5                     BIT STRING (SIZE (16)),
        n2TxAntenna-tm6                     BIT STRING (SIZE (4)),
        n4TxAntenna-tm6                     BIT STRING (SIZE (16))
    }       OPTIONAL,                                                   -- Cond TM
    ue-TransmitAntennaSelection         CHOICE{
            release                         NULL,
            setup                           ENUMERATED {closedLoop, openLoop}
    }
}

AntennaInfoDedicated-v920 ::=       SEQUENCE {
    codebookSubsetRestriction-v920      CHOICE {
        n2TxAntenna-tm8-r9                  BIT STRING (SIZE (6)),
        n4TxAntenna-tm8-r9                  BIT STRING (SIZE (32))
```

```
    }       OPTIONAL                                                    -- Cond TM8
}

AntennaInfoDedicated-r10 ::=        SEQUENCE {
    -- FFS if AntennaInfoDedicatedSCell should be introduced
    transmissionMode-r10                    ENUMERATED {
                                            tm1, tm2, tm3, tm4, tm5, tm6, tm7, tm8-v920,
                                            tm9-v10x0, spare7, spare6, spare5, spare4,
                                            spare3,spare2, spare1},
    codebookSubsetRestriction-r10       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))
        n2TxAntenna-tm8-r9                  BIT STRING (SIZE (6)),
        n4TxAntenna-tm8-r9                  BIT STRING (SIZE (32)),
        n2TxAntenna-tm9-r10                 BIT STRING (SIZE (6)),
        n4TxAntenna-tm9-r10                 BIT STRING (SIZE (64)),
        n8TxAntenna-tm9-r10                 BIT STRING (SIZE (FFS)),
        ...
    }       OPTIONAL,                                                   -- Cond TMX
    ue-TransmitAntennaSelection-r10     CHOICE{
            release                         NULL,
            setup                           ENUMERATED {closedLoop, openLoop}
    }
}

-- ASN1STOP
```

***AntennaInfo* field descriptions**
antennaPortsCount Parameter represents the number of cell specific antenna ports where an1 corresponds to 1, an2 to 2 antenna ports etc. see TS 36.211 [21, 6.2.1].
transmissionMode Points to one of Transmission modes defined in TS 36.213 [23, 7.1] where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.
codebookSubsetRestriction Parameter: *codebookSubsetRestriction,* see TS 36.213 [23, 7.2] and TS 36.211 [21, 6.3.4.2.3]. The field *codebookSubsetRestriction-v920* is applicable only if PMI/RI reporting is configured.
ue-TransmitAntennaSelection For value *setup* the field indicates whether UE transmit antenna selection control is closed-loop or open-loop as described in TS 36.213 [23, 8.7].

Conditional presence	Explanation
TM	The field is mandatory present if the *transmissionMode* is set to tm3, tm4, tm5 or tm6. Otherwise the field is not present and the UE shall delete any existing value for this field.
TM8	The field is optional present, need OR, if *AntennaInfoDedicated* is included and *transmissionMode* is set to *tm8*. If *AntennaInfoDedicated* is included and *transmissionMode* is set to a value other than *tm8*, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present and the UE takes no action i.e. continues to use the existing value, if previously configured.
TMX	The field is mandatory present if the *transmissionMode* is set to *tm3*, *tm4*, *tm5*, *tm6*, *tm8* or *tm9*. Otherwise the field is not present and the UE shall delete any existing value for this field.

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– *CrossCarrierSchedulingConfig*

The IE *CrossCarrierSchedulingConfig* is used to specify the configuration when the cross carrier scheduling is used in a cell.

***CrossCarrierSchedulingConfig* information elements**

```
-- ASN1START
```

```
CrossCarrierSchedulingConfig-r10 ::=        SEQUENCE {
    schedulingCellInfo              CHOICE {
        own                             SEQUENCE {                  -- No cross carrier scheduling
            cif-Presence                    BOOLEAN
        },
        other                           SEQUENCE {                  -- Cross carrier scheduling
            schedulingCellId-r10            ServCellIndex-r10,
            pdsch-Start-r10                 INTEGER (1..4)
        }
    },
    ...
}

-- ASN1STOP
```

***CrossCarrierSchedulingConfig* field descriptions**
pdsch-Start The starting OFDM symbol of PDSCH for the concerned SCell, see TS 36.213 [23. 7.1.6.4]. Values 1, 2, 3 are applicable when *dl-Bandwith* for the concerned SCell is greater than 10, values 2, 3, 4 are applicable when *dl-Bandwidth* for the concerned SCell is less than or equal to 10, see TS 36.211 [21, Table 6.7-1].
schedulingCellId Indicates which cell signals the downlink allocations and uplink grants, if applicable, for the concerned SCell.

– *CQI-ReportConfig*

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

***CQI-ReportConfig* information elements**

```
-- ASN1START

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

CQI-ReportConfigSCell-r10 ::=               SEQUENCE {
    -- FFS is a specific version of CQI-ReportConfig is needed
    cqi-ReportModeAperiodic         ENUMERATED {
                                            rm12, rm20, rm22, rm30, rm31,
                                            spare3, spare2, spare1} OPTIONAL,           -- Need OR
    nomPDSCH-RS-EPRE-Offset             INTEGER (-1..6),
    -- FFS if cqi-ReportPeriodic is provided per SCell
    -- FFS if cqi-Mask-r9 is provided per SCell
    -- FFS if pmi-RI-Report-r9 is provided per SCell
    -- Has been agreed that cqi-FormatIndicatorPeriodic is provided per SCell
    -- to be captured after it is clear how to include the cqi-ReportPeriodic for SCell
    -- FFS how to include ri-ReportMode-r10 in CQI-ReportConfigSCell
    -- depending if cqi-ReportPeriodic is included for SCell
}

CQI-ReportConfig-v920 ::=       SEQUENCE {
    cqi-Mask-r9                     ENUMERATED {setup}      OPTIONAL,       -- Cond cqi-Setup
    pmi-RI-Report-r9                ENUMERATED {setup}      OPTIONAL        -- Cond PMIRI
}

CQI-ReportConfig-v10x0 ::=      SEQUENCE {
    ri-ReportMode-r10               ENUMERATED {riWithW1, riWithoutW1}      OPTIONAL,   -- Cond FFS
    twoAntennaPortActivated-r10     ENUMERATED {true}                       OPTIONAL,   -- Need OR
    -- FFS if the cqi-PUCCH-ResourceIndexP1 is a list of resources for all activated cells
    cqi-PUCCH-ResourceIndexP1-r10   INTEGER (0.. 1185)                      OPTIONAL    -- Cond FFS
}

CQI-ReportPeriodic ::=      CHOICE {
    release                         NULL,
    setup                           SEQUENCE {
        cqi-PUCCH-ResourceIndex             INTEGER (0.. 1185),
        cqi-pmi-ConfigIndex                 INTEGER (0..1023),
        cqi-FormatIndicatorPeriodic         CHOICE {
            widebandCQI                         NULL,
```

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```
            subbandCQI                          SEQUENCE {
                k                                   INTEGER (1..4)
            }
        },
        ri-ConfigIndex                      INTEGER (0..1023)   OPTIONAL,               -- Need OR
        simultaneousAckNackAndCQI           BOOLEAN
    }
}

-- ASN1STOP
```

***CQI-ReportConfig* field descriptions**
cqi-PUCCH-ResourceIndex Parameter $n_{\mathrm{PUCCH}}^{(2,p)}$ for antenna port P0, see TS 36.213 [23, 7.2].
twoAntennaPortActivated Parameter and reference tbd.
cqi-PUCCH-ResourceIndexP1 Parameter: $n_{\mathrm{PUCCH}}^{(2,p)}$ for antenna port P1, see TS 36.213 [23, 7.2].
cqi-pmi-ConfigIndex Parameter: CQI/PMI Periodicity and Offset Configuration Index $I_{CQI/PMI}$, see TS 36.213 [23, tables 7.2.2-1A and 7.2.2-1C].
ri-ConfigIndex Parameter: RI Config Index I_{RI}, see TS 36.213 [23, 7.2.2-1B].
K Parameter: K, see TS 36.213 [23, 7.2.2].
cqi-FormatIndicatorPeriodic Parameter: *PUCCH CQI Feedback Type, see* TS 36.213 [23, table 7.2.2-1]. Depending on transmissionMode, reporting mode is implicitly given from the table.
ri-ReportMode Parameter and reference tbd.
simultaneousAckNackAndCQI Parameter: *Simultaneous-AN-and-CQI*. see TS 36.213 [23, 10.1] TRUE indicates that simultaneous transmission of ACK/NACK and CQI is allowed.
cqi-ReportModeAperiodic Parameter: *reporting mode.* Value rm12 corresponds to Mode 1-2, rm20 corresponds to Mode 2-0, rm22 corresponds to Mode 2-2 etc. PUSCH reporting modes are described in TS 36.213 [23, 7.2.1].
nomPDSCH-RS-EPRE-Offset Parameter: Δ_{offset} *see* TS 36.213 [23, 7.2.3]. Actual value = IE value * 2 [dB].
cqi-Mask Limits CQI/PMI/RI reports to the on-duration period of the DRX cycle, see TS 36.321 [6].
pmi-RI-Report See TS 36.213 [23, 7.2]. The presence of this field means PMI/RI reporting is configured, which is applicable only when *transmissionMode* is set to *tm8*; otherwise PMI/RI reporting is not configured.

Conditional presence	Explanation
cqi-Setup	The field is optional present, need OR, if the *cqi-ReportPeriodic* in the *cqi-ReportConfig* is set to '*setup*'. If the field *cqi-ReportPeriodic* is present and set to '*release*', the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present and the UE takes no action i.e. continues to use the existing value, if previously configured.
PMIRI	The field is optional present, need OR, if *cqi-ReportPeriodic* is included and set to '*setup*', or *cqi-ReportModeAperiodic* is included. If the field *cqi-ReportPeriodic* is present and set to '*release*' and *cqi-ReportModeAperiodic* is absent, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present and the UE takes no action i.e. continues to use the existing value, if previously configured.

– *CSI-RS-Config*

The IE *CSI-RS-Config* is used to specify the CSI (Channel-State Information) reference signal configuration. The IE only applies when DL transmission mode *tm9* is configured. It is FFS whether this applies independent of which feedback reporting mode is configured.

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CSI-RS-Config information elements

```
-- ASN1START

CSI-RS-Config-r10 ::=       CHOICE {
    release                         NULL,
    setup                           SEQUENCE {
        csi-RS-Ports-r10                ENUMERATED {an1, an2, an4, an8},
        locationIndex-r10               INTEGER (0..31),
        csi-RS-SubframeConfig-r10       INTEGER (0..154),
        rho-C-r10                       BIT STRING (SIZE (16)),
        csi-RS-WithZeroTransmissionPower-r10    BIT STRING (SIZE (16))
    }
}                                                                   -- Value ranges FFS

-- ASN1STOP
```

***CSI-RS-Config* field descriptions**
csi-RS-Ports Parameter and reference tbd.
locationIndex Parameter and reference tbd.
csi-RS-SubframeConfig Parameter and reference tbd.
rho-C Parameter and reference tbd.
csi-RS-WithZeroTransmissionPower Parameter and reference TBD.

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– *MAC-MainConfig*

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

MAC-MainConfig information element

```
-- ASN1START

MAC-MainConfig ::=                  SEQUENCE {
    ul-SCH-Config                       SEQUENCE {
        maxHARQ-Tx                          ENUMERATED {
                                                n1, n2, n3, n4, n5, n6, n7, n8,
                                                n10, n12, n16, n20, n24, n28,
                                                spare2, spare1}     OPTIONAL,   -- Need ON
        periodicBSR-Timer                   ENUMERATED {
                                                sf5, sf10, sf16, sf20, sf32, sf40, sf64, sf80,
                                                sf128, sf160, sf320, sf640, sf1280, sf2560,
                                                infinity, spare1}   OPTIONAL,   -- Need ON
        retxBSR-Timer                       ENUMERATED {
                                                sf320, sf640, sf1280, sf2560, sf5120,
                                                sf10240, spare2, spare1},
        ttiBundling                         BOOLEAN
    }                                                               OPTIONAL,   -- Need ON
    drx-Config                          DRX-Config                  OPTIONAL,   -- Need ON
    timeAlignmentTimerDedicated         TimeAlignmentTimer,
    phr-Config                          CHOICE {
        release                             NULL,
        setup                               SEQUENCE {
            periodicPHR-Timer                   ENUMERATED {sf10, sf20, sf50, sf100, sf200,
                                                            sf500, sf1000, infinity},
            prohibitPHR-Timer                   ENUMERATED {sf0, sf10, sf20, sf50, sf100,
                                                            sf200, sf500, sf1000},
            dl-PathlossChange                   ENUMERATED {dB1, dB3, dB6, infinity}
        }
    }                                                               OPTIONAL,   -- Need ON
    ...,
    [[  sr-ProhibitTimer-r9             INTEGER (0..7)              OPTIONAL    -- Need ON
    ]],
    [[  sCellDeactivationTimer-r10      ENUMERATED {
                                            rf2, rf4, rf8, rf16, rf32, rf64, rf128,
```

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```
                                            infinity}           OPTIONAL,    -- Need ON
        extendedBSR-Sizes-r10               BOOLEAN             OPTIONAL,    -- Need ON
        extendedPHR-r10                     BOOLEAN             OPTIONAL     -- Need ON
        -- PHR type 2 configuration parameters may be introduced here
        -- The details of PHR type 2 (e.g. configuration parameter) are FFS
    ]]
}

DRX-Config ::=                      CHOICE {
    release                             NULL,
    setup                               SEQUENCE {
        onDurationTimer                     ENUMERATED {
                                                psf1, psf2, psf3, psf4, psf5, psf6,
                                                psf8, psf10, psf20, psf30, psf40,
                                                psf50, psf60, psf80, psf100,
                                                psf200},
        drx-InactivityTimer                 ENUMERATED {
                                                psf1, psf2, psf3, psf4, psf5, psf6,
                                                psf8, psf10, psf20, psf30, psf40,
                                                psf50, psf60, psf80, psf100,
                                                psf200, psf300, psf500, psf750,
                                                psf1280, psf1920, psf2560, spare10,
                                                spare9, spare8, spare7, spare6,
                                                spare5, spare4, spare3, spare2,
                                                spare1},
        drx-RetransmissionTimer             ENUMERATED {
                                                psf1, psf2, psf4, psf6, psf8, psf16,
                                                psf24, psf33},
        longDRX-CycleStartOffset        CHOICE {
            sf10                            INTEGER(0..9),
            sf20                            INTEGER(0..19),
            sf32                            INTEGER(0..31),
            sf40                            INTEGER(0..39),
            sf64                            INTEGER(0..63),
            sf80                            INTEGER(0..79),
            sf128                           INTEGER(0..127),
            sf160                           INTEGER(0..159),
            sf256                           INTEGER(0..255),
            sf320                           INTEGER(0..319),
            sf512                           INTEGER(0..511),
            sf640                           INTEGER(0..639),
            sf1024                          INTEGER(0..1023),
            sf1280                          INTEGER(0..1279),
            sf2048                          INTEGER(0..2047),
            sf2560                          INTEGER(0..2559)
        },
        shortDRX                            SEQUENCE {
            shortDRX-Cycle                      ENUMERATED  {
                                                    sf2, sf5, sf8, sf10, sf16, sf20,
                                                    sf32, sf40, sf64, sf80, sf128, sf160,
                                                    sf256, sf320, sf512, sf640},
            drxShortCycleTimer                  INTEGER (1..16)
        }       OPTIONAL                                                -- Need OR
    }
}

-- ASN1STOP
```

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***MAC-MainConfig* field descriptions**
maxHARQ-Tx Maximum number of transmissions for UL HARQ in TS 36.321 [6].
periodicBSR-Timer Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on.
retxBSR-Timer Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf640 corresponds to 640 sub-frames, sf1280 corresponds to 1280 sub-frames and so on.
ttiBundling TRUE indicates that TTI bundling TS 36.321 [6] is enabled while FALSE indicates that TTI bundling is disabled. TTI bundling can be enabled for FDD and for TDD only for configurations 0, 1 and 6. For TDD, E-UTRAN does not simultaneously enable TTI bundling and semi-persistent scheduling in this release of specification. Furthermore, E-UTRAN does not simultaneously configure TTI bundling and SCells.
longDRX-CycleStartOffset *longDRX-Cycle* and *drxStartOffset* in TS 36.321 [6]. The value of l*ongDRX-Cycle* is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. If *shortDRX-Cycle* is configured, the value of *longDRX-Cycle* shall be a multiple of the *shortDRX-Cycle* value. The value of *drxStartOffset* value is in number of sub-frames.
onDurationTimer Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.
drx-InactivityTimer Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.
drx-RetransmissionTimer Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.
shortDRX-Cycle Short DRX cycle in TS 36.321 [6]. Value in number of sub-frames. Value sf2 corresponds to 2 sub-frames, sf5 corresponds to 5 subframes and so on.
drxShortCycleTimer Timer for DRX in TS 36.321 [6]. Value in multiples of shortDRX-Cycle. A value of 1 corresponds to shortDRX-Cycle, a value of 2 corresponds to 2 * shortDRX-Cycle and so on.
extendedBSR-Sizes If value TRUE is configured, the BSR index indicates extended BSR size levels as defined in TS 36.321 [6, Table 6.1.3.1-2].
extendedPHR Indicates if power headroom shall be reported using the Extended Power Headroom Report MAC control element defined in TS 36.321 [6] (value TRUE) or the Power Headroom Report MAC control element defined in TS 36.321 [6] (value FALSE).
periodicPHR-Timer Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 subframes, sf20 corresponds to 20 subframes and so on.
prohibitPHR-Timer Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf0 corresponds to 0 subframes, sf100 corresponds to 100 subframes and so on.
dl-PathlossChange DL Pathloss Change for PHR reporting in TS 36.321 [6]. Value in dB. Value dB1 corresponds to 1 dB, dB3 corresponds to 3 dB and so on.
sr-ProhibitTimer Timer for SR transmission on PUCCH in TS 36.321 [6]. Value in number of SR period(s). Value 0 means no timer for SR transmission on PUCCH is configured. Value 1 corresponds to one SR period, Value 2 corresponds to 2*SR periods and so on.

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eNote The details of the PHR-Configuration that applies when multiple serving cells are configured are FFS.

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– *PhysicalConfigDedicated*

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

PhysicalConfigDedicated information element

```
-- ASN1START
```

```
PhysicalConfigDedicated ::=     SEQUENCE {
    pdsch-ConfigDedicated               PDSCH-ConfigDedicated           OPTIONAL,       -- Need ON
    pucch-ConfigDedicated               PUCCH-ConfigDedicated           OPTIONAL,       -- Need ON
    pusch-ConfigDedicated               PUSCH-ConfigDedicated           OPTIONAL,       -- Need ON
    uplinkPowerControlDedicated     UplinkPowerControlDedicated     OPTIONAL,       -- Need ON
    tpc-PDCCH-ConfigPUCCH               TPC-PDCCH-Config                OPTIONAL,       -- Need ON
    tpc-PDCCH-ConfigPUSCH               TPC-PDCCH-Config                OPTIONAL,       -- Need ON
    cqi-ReportConfig                    CQI-ReportConfig                OPTIONAL,       -- Need ON
    soundingRS-UL-ConfigDedicated       SoundingRS-UL-ConfigDedicated   OPTIONAL,       -- Need ON
    antennaInfo                         CHOICE {
        explicitValue                       AntennaInfoDedicated,
        defaultValue                        NULL
    }       OPTIONAL,                                                                   -- Cond AI-
r8
    schedulingRequestConfig         SchedulingRequestConfig     OPTIONAL,           -- Need ON
    ...,
    [[  cqi-ReportConfig-v920               CQI-ReportConfig-v920       OPTIONAL,       -- Need ON
        antennaInfo-v920                    AntennaInfoDedicated-v920   OPTIONAL        -- Need ON
    ]],
    [[  antennaInfo-r10                 CHOICE {
            explicitValue                   AntennaInfoDedicated-r10,
            defaultValue                    NULL
        }       OPTIONAL,                                                           -- Cond AI-r10
        cif-Presence                    BOOLEAN                         OPTIONAL,   -- Need ON
        -- FFS whether CSI-RS-Config should be included in physicalConfigDedicated
        cqi-ReportConfig-v10x0          CQI-ReportConfig-v10x0          OPTIONAL,       -- Need ON
        csi-RS-Config-r10               CSI-RS-Config-r10               OPTIONAL,       -- Need ON
        pucch-ConfigDedicated-v10x0     PUCCH-ConfigDedicated-v10x0     OPTIONAL,       -- Need ON
        pusch-ConfigDedicated-v10x0     PUSCH-ConfigDedicated-v10x0     OPTIONAL,       -- Need ON
        schedulingRequestConfig-v10x0   SchedulingRequestConfig-v10x0   OPTIONAL,       -- Need ON
        soundingRS-UL-ConfigDedicated-v10x0
                                    SoundingRS-UL-ConfigDedicated-v10x0 OPTIONAL,       -- Need ON
        soundingRS-UL-ConfigDedicatedAperiodic-r10
                                SoundingRS-UL-ConfigDedicatedAperiodic-r10  OPTIONAL,   -- Need ON
        -- The usage of field soundingRS-UL-ConfigDedicatedAperiodic-r10 is FFS
        ul-AntennaInfo-r10              UL-AntennaInfo-r10              OPTIONAL        -- Need ON
    ]]

}

PhysicalConfigDedicatedSCell-r10 ::=        SEQUENCE {
    -- DL configuration as well as configuration applicable for DL and UL
    nonULConfiguration                  SEQUENCE {
        antennaInfo-r10                     AntennaInfoDedicated-r10            OPTIONAL,   -- Need
ON
        crossCarrierSchedulingConfig-r10        CrossCarrierSchedulingConfig-r10    OPTIONAL,   --
Need ON
        -- FFS whether CSI-RS-Config should be included in physicalConfigDedicated
        csi-RS-Config-r10               CSI-RS-Config-r10               OPTIONAL,   -- Need ON
        pdsch-ConfigDedicated-r10       PDSCH-ConfigDedicated           OPTIONAL    -- Need ON
    }                                                                   OPTIONAL,   -- Cond SCellAdd
    -- UL configuration
    ul-Configuration                    CHOICE {
        release                             NULL,
        setup                               SEQUENCE {
            pusch-ConfigDedicated-r10           PUSCH-ConfigDedicated       OPTIONAL,   -- Need ON
            pusch-ConfigDedicated-v10x0         PUSCH-ConfigDedicated-v10x0 OPTIONAL,   -- Need ON
            uplinkPowerControlDedicated-r10     UplinkPowerControlDedicatedSCell-r10    OPTIONAL, --
Need ON
            -- FFS if (part of) tpc-PDCCH-ConfigPUSCH is needed
            cqi-ReportConfig-r10                CQI-ReportConfigSCell-r10   OPTIONAL,   -- Need ON
            soundingRS-UL-ConfigDedicated-r10   SoundingRS-UL-ConfigDedicated   OPTIONAL,   -- Need
ON
            soundingRS-UL-ConfigDedicated-v10x0
                                        SoundingRS-UL-ConfigDedicated-v10x0 OPTIONAL,       -- Need ON
            soundingRS-UL-ConfigDedicatedAperiodic-r10
                                    SoundingRS-UL-ConfigDedicatedAperiodic-r10  OPTIONAL,   -- Need ON
            -- The usage of field soundingRS-UL-ConfigDedicatedAperiodic-r10 is FFS
            ul-AntennaInfo-r10                  UL-AntennaInfo-r10          OPTIONAL    -- Need ON
        }
    }                                                                       OPTIONAL,   -- Need ON
    ...
}

-- ASN1STOP
```

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***PhysicalConfigDedicated* field descriptions**
antennaInfo A choice is used to indicate whether the *antennaInfo* is signalled explicitly or set to the default antenna configuration as specified in section 9.2.4.
tpc-PDCCH-ConfigPUCCH PDCCH configuration for power control of PUCCH using format 3/3A, see TS 36.212 [22].
tpc-PDCCH-ConfigPUSCH PDCCH configuration for power control of PUSCH using format 3/3A, see TS 36.212 [22].

Conditional presence	Explanation
AI-r8	The field is optionally present, need ON, if *antennaInfoDedicated-r10* is absent. Otherwise the field is not present
AI-r10	The field is optionally present, need ON, if *antennaInfoDedicated-r8* is absent. Otherwise the field is not present
SCellAdd	The field is mandatory present if *cellIdentification* is present; otherwise it is optional, need ON.

NOTE 1: During handover, the UE performs a MAC reset, which involves reverting to the default CQI/ SRS/ SR configuration in accordance with subclause 5.3.13 and TS 36.321 [6, 5.9 & 5.2]. Hence, for these parts of the dedicated radio resource configuration, the default configuration (rather than the configuration used in the source PCell) is used as the basis for the delta signalling that is included in the message used to perform handover.

NOTE 2: Since delta signalling is not supported for the common SCell configuration, E-UTRAN can only add and release the uplink of an SCell by releasing and adding the concerned SCell.

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– *PRACH-Config*

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

***PRACH-Config* information elements**

```
-- ASN1START

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

PRACH-ConfigSCell-r10 ::=               SEQUENCE {
    prach-ConfigIndex                   INTEGER (0..63)
}

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

PRACH-ConfigInfo ::=                SEQUENCE {
    prach-ConfigIndex                   INTEGER (0..63),
    highSpeedFlag                       BOOLEAN,
    zeroCorrelationZoneConfig           INTEGER (0..15),
    prach-FreqOffset                    INTEGER (0..94)
}

-- ASN1STOP
```

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***PRACH-Config* field descriptions**
rootSequenceIndex Parameter: *RACH_ROOT_SEQUENCE*, see TS 36.211 [21, 5.7.1].
prach-ConfigIndex Parameter: *prach-ConfigurationIndex*, see TS 36.211 [21, 5.7.1].
highSpeedFlag Parameter: High-speed-flag, see TS 36.211, [21, 5.7.2].TRUE corresponds to Restricted set and FALSE to Unrestricted set.
zeroCorrelationZoneConfig Parameter: N_{CS} configuration, see TS 36.211, [21, 5.7.2: table 5.7.2-2] for preamble format 0..3 and TS 36.211, [21, 5.7.2: table 5.7.2-3] for preamble format 4.
prach-FreqOffset Parameter: *prach-FrequencyOffset,* see TS 36.211, [21, 5.7.1]. For TDD the value range is dependent on the value of *prach-ConfigIndex*.

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– *PUCCH-Config*

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

***PUCCH-Config* information elements**

```
-- ASN1START

PUCCH-ConfigCommon ::=              SEQUENCE {
    deltaPUCCH-Shift                    ENUMERATED {ds1, ds2, ds3},
    nRB-CQI                             INTEGER (0..98),
    nCS-AN                              INTEGER (0..7),
    n1PUCCH-AN                          INTEGER (0..2047)
}

PUCCH-ConfigDedicated ::=           SEQUENCE {
    ackNackRepetition                   CHOICE{
        release                             NULL,
        setup                               SEQUENCE {
            repetitionFactor                    ENUMERATED {n2, n4, n6, spare1},
            n1PUCCH-AN-Rep                      INTEGER (0..2047)
        }
    },
    tdd-AckNackFeedbackMode             ENUMERATED {bundling, multiplexing} OPTIONAL    -- Cond TDD
}

PUCCH-ConfigDedicated-v10x0 ::=     SEQUENCE {
    -- FFS whether it is a list of resource values or only one value
    n3PUCCH-AN-List-r10     SEQUENCE (SIZE (1..FFS)) OF INTEGER (FFS)       OPTIONAL,   -- Need FFS
    n1PUCCH-AN-CS-List-r10  SEQUENCE (SIZE (1..FFS)) OF INTEGER (FFS)       OPTIONAL,   -- Need FFS
    pucch-Format-r10        ENUMERATED {format3, channelSelection}          OPTIONAL,   -- Need FFS
    simultaneousPUCCH-PUSCH-r10     ENUMERATED {true}                       OPTIONAL,   -- Need OR
    -- FFS whether SORTD activation is used for ackNackRepetition
    twoAntennaPortActivated-r10     ENUMERATED {true}                       OPTIONAL,   -- Need OR
    n1PUCCH-AN-RepP1-r10                INTEGER (0..2047)                       OPTIONAL        --
Cond FFS
}

-- ASN1STOP
```

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PUCCH-Config field descriptions
deltaPUCCH-Shift Parameter: $\Delta_{\text{shift}}^{\text{PUCCH}}$, see 36.211, 5.4.1, where ds1 corresponds to value 1 ds2 to 2 etc.
nRB-CQI Parameter: $N_{\text{RB}}^{(2)}$, see TS 36.211 [21, 5.4].
nCS-An Parameter: $N_{cs}^{(1)}$ see TS 36.211 [21, 5.4].
n1Pucch-AN Parameter: $n_{\text{PUCCH, ANRep}}^{(1,p)}$ for antenna port P0, see TS 36.213 [23, 10.1].
twoAntennaPortActivated Parameter and reference tbd.
n1Pucch-AN-RepP1 Parameter: $n_{\text{PUCCH, ANRep}}^{(1,p)}$ for antenna port P1, see TS 36.213 [23, 10.1].
ackNackRepetition Parameter indicates whether ACK/NACK repetition is configured, see TS 36.213 [23, 10.1].
repetitionFactor Parameter N_{ANRep} see TS 36.213 [23, 10.1] where n2 corresponds to repetition factor 2, n4 to 4.
n1Pucch-AN-Rep Parameter: $n_{\text{PUCCH, ANRep}}^{(1)}$ see TS 36.213 [23, 10.1].
n1PUCCH-AN-CS-List Parameter and reference: tbd
n3PUCCH-AN-List Parameter and reference: tbd
pucch-Format Parameter indicates one of the PUCCH formats used, see TS 36.213 [23, tbd].
tdd-AckNackFeedbackMode Parameter indicates one of the two TDD ACK/NACK feedback modes used, see TS 36.213 [23, 7.3]. bundling corresponds to use of ACK/NACK bundling whereas, multiplexing corresponds to ACK/NACK multiplexing. The same value applies to both ACK/NACK feedback modes on PUCCH as well as on PUSCH. For TDD configuration 5, E-UTRAN should always set this field to bundling.
simultaneousPUCCH-PUSCH Parameter indicates whether simultaneous PUCCH and PUSCH transmissions is enabled, see TS 36.213 [23, tbd].

Conditional presence	Explanation
TDD	The field is mandatory present for TDD; it is not present for FDD and the UE shall delete any existing value for this field.

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– *PUSCH-Config*

The IE *PUSCH-ConfigCommon* is used to specify the common PUSCH configuration and the reference signal configuration for PUSCH and PUCCH. The IE *PUSCH-ConfigDedicated* is used to specify the UE specific PUSCH configuration.

***PUSCH-Config* information element**

```
-- ASN1START

PUSCH-ConfigCommon ::=              SEQUENCE {
    pusch-ConfigBasic                   SEQUENCE {
        n-SB                                INTEGER (1..4),
        hoppingMode                         ENUMERATED {interSubFrame, intraAndInterSubFrame},
        pusch-HoppingOffset                 INTEGER (0..98),
        enable64QAM                         BOOLEAN
    },
    ul-ReferenceSignalsPUSCH            UL-ReferenceSignalsPUSCH
}

PUSCH-ConfigDedicated ::=           SEQUENCE {
    betaOffset-ACK-Index                INTEGER (0..15),
    betaOffset-RI-Index               INTEGER (0..15),
```

```
    betaOffset-CQI-Index                    INTEGER (0..15)
}

PUSCH-ConfigDedicated-v10x0 ::=     SEQUENCE {
    betaOffset-ACK-Index-MC-r10         INTEGER (FFS),
    betaOffset-RI-Index-MC-r10          INTEGER (FFS),
    betaOffset-CQI-Index-MC-r10         INTEGER (FFS),
    groupHoppingDisabled-r10                ENUMERATED {true}                   OPTIONAL,   --Need
OR
    dmrs-WithOCC-Activated-r10          ENUMERATED {true}                   OPTIONAL        --Need
OR
}

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

-- ASN1STOP
```

***PUSCH-Config* field descriptions**
n-SB Parameter: N_{sb} see TS 36.211 [21, 5.3.4].
hoppingMode Parameter: *Hopping-mode*, see TS 36.211 [21, 5.3.4].
pusch-hoppingOffset Parameter: N_{RB}^{HO} , see TS 36.211 [21, 5.3.4].
enable64QAM See TS 36.213 [23, 8.6.1]. TRUE indicates that 64QAM is allowed while FALSE indicates that 64QAM is not allowed.
betaOffset-ACK-Index Parameter: $I_{offset}^{HARQ-ACK}$, see TS 36.213 [23, Table 8.6.3-1].
betaOffset-ACK-Index-MC Parameter and reference: tbd
betaOffset-RI-Index Parameter: I_{offset}^{RI} , see TS 36.213 [23, Table 8.6.3-2].
betaOffset-RI-Index-MC Parameter and reference: tbd
betaOffset-CQI-Index Parameter: I_{offset}^{CQI} , see TS 36.213 [23, Table 8.6.3-3].
betaOffset-CQI-Index-MC Parameter and reference: tbd
ul- ReferenceSignalsPUSCH Used to specify parameters needed for the transmission on PUSCH (or PUCCH).
groupHoppingEnabled Parameter: *Group-hopping-enabled*, see TS 36.211 [21, 5.5.1.3].
groupHoppingDisabled Parameter: *Disable-sequence-group-hopping*, see TS 36.211 [21, 5.5.1.3].
groupAssignmentPUSCH Parameter: *ΔSS* See TS 36.211 [21, 5.5.1.3].
sequenceHoppingEnabled Parameter: *Sequence-hopping-enabled*, see TS 36.211 [21, 5.5.1.4].
cyclicShift Parameters: *cyclicShift*, see TS 36.211 [21, Table 5.5.2.1.1-2].
dmrs-WithOCC-Activated Parameter: *Activate-DMRS-with OCC*, see TS 36.211 [21, 5.5.2.1].

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– *RadioResourceConfigCommon*

The IE *RadioResourceConfigCommonSIB* and IE *RadioResourceConfigCommon* are used to specify common radio resource configurations in the system information and in the mobility control information, respectively, e.g., the random access parameters and the static physical layer parameters.

RadioResourceConfigCommon information element

```
-- ASN1START

RadioResourceConfigCommonSIB ::=    SEQUENCE {
    rach-ConfigCommon                   RACH-ConfigCommon,
    bcch-Config                         BCCH-Config,
    pcch-Config                         PCCH-Config,
    prach-Config                        PRACH-ConfigSIB,
    pdsch-ConfigCommon                  PDSCH-ConfigCommon,
    pusch-ConfigCommon                  PUSCH-ConfigCommon,
    pucch-ConfigCommon                  PUCCH-ConfigCommon,
    soundingRS-UL-ConfigCommon          SoundingRS-UL-ConfigCommon,
    uplinkPowerControlCommon            UplinkPowerControlCommon,
    ul-CyclicPrefixLength               UL-CyclicPrefixLength,
    ...,
    [[  uplinkPowerControlCommon-v10x0  UplinkPowerControlCommon-v10x0      OPTIONAL    -- Need OR
    ]]
}

RadioResourceConfigCommon ::=       SEQUENCE {
    rach-ConfigCommon                   RACH-ConfigCommon                   OPTIONAL,   -- Need ON
    prach-Config                        PRACH-Config,
    pdsch-ConfigCommon                  PDSCH-ConfigCommon                  OPTIONAL,   -- Need ON
    pusch-ConfigCommon                  PUSCH-ConfigCommon,
    phich-Config                        PHICH-Config                        OPTIONAL,   -- Need ON
    pucch-ConfigCommon                  PUCCH-ConfigCommon                  OPTIONAL,   -- Need ON
    soundingRS-UL-ConfigCommon          SoundingRS-UL-ConfigCommon          OPTIONAL,   -- Need ON
    uplinkPowerControlCommon            UplinkPowerControlCommon            OPTIONAL,   -- Need ON
    antennaInfoCommon                   AntennaInfoCommon           OPTIONAL,   -- Need ON
    p-Max                               P-Max                               OPTIONAL,   -- Need OP
    tdd-Config                          TDD-Config                          OPTIONAL,   -- Cond TDD
    ul-CyclicPrefixLength               UL-CyclicPrefixLength,
    ...,
    [[  uplinkPowerControlCommon-v10x0  UplinkPowerControlCommon-v10x0      OPTIONAL    -- Need ON
    ]]
}

RadioResourceConfigCommonSCell-r10 ::=  SEQUENCE {
    -- DL configuration as well as configuration applicable for DL and UL
    nonULConfiguration                  SEQUENCE {
        -- 1: Cell characteristics
        dl-Bandwidth-r10                        ENUMERATED {n6, n15,
                                                n25, n50, n75, n100},
        -- 2: Physical configuration, general
        antennaInfoCommon-r10               AntennaInfoCommon,
        mbsfn-SubframeConfigList-r10            MBSFN-SubframeConfigList        OPTIONAL,   -- Need
OR
        -- 3: Physical configuration, control
        phich-Config-r10                        PHICH-Config,
        -- 4: Physical configuration, physical channels
        pdsch-ConfigCommon-r10              PDSCH-ConfigCommon
    },
    -- UL configuration
    ul-Configuration                        SEQUENCE {
        ul-FreqInfo-r10                     SEQUENCE {
            ul-CarrierFreq-r10                  ARFCN-ValueEUTRA            OPTIONAL,   -- Need OP
            ul-Bandwidth-r10                        ENUMERATED {n6, n15,
                                                    n25, n50, n75, n100}    OPTIONAL,   -- Need OP
            additionalSpectrumEmission-r10      AdditionalSpectrumEmission
        },
        p-Max-r10                           P-Max                       OPTIONAL,   -- Need OP
        uplinkPowerControlCommon-r10            UplinkPowerControlCommonSCell-r10,
        -- A special version of IE UplinkPowerControlCommon may be introduced
        -- 3: Physical configuration, control
        soundingRS-UL-ConfigCommon-r10      SoundingRS-UL-ConfigCommon,
        ul-CyclicPrefixLength-r10           UL-CyclicPrefixLength,
        -- 4: Physical configuration, physical channels
        prach-Config                            PRACH-ConfigSCell-r10       OPTIONAL,   -- Cond TDD-
OR
```

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```
        pusch-ConfigCommon-r10              PUSCH-ConfigCommon
    }                                                                   OPTIONAL,   -- Need OR
    ...
}

BCCH-Config ::=                     SEQUENCE {
    modificationPeriodCoeff             ENUMERATED {n2, n4, n8, n16}
}

PCCH-Config ::=                     SEQUENCE {
    defaultPagingCycle                  ENUMERATED {
                                            rf32, rf64, rf128, rf256},
    nB                                  ENUMERATED {
                                            fourT, twoT, oneT, halfT, quarterT, oneEighthT,
                                            oneSixteenthT, oneThirtySecondT}
}

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

-- ASN1STOP
```

***RadioResourceConfigCommon* field descriptions**
p-Max Pmax to be used in the target cell. If absent the UE applies the maximum power according to the UE capability.
modificationPeriodCoeff Actual modification period, expressed in number of radio frames= *modificationPeriodCoeff* * *defaultPagingCycle*. n2 corresponds to value 2, n4 corresponds to value 4, n8 corresponds to value 8 and n16 corresponds to value 16.
defaultPagingCycle Default paging cycle, used to derive 'T' in TS 36.304 [4]. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on.
nB Parameter: nB is used as one of parameters to derive the Paging Frame and Paging Occasion according to TS 36.304 [4]. Value in multiples of *defaultPagingCycle* ('T'). A value of fourT corresponds to 4 * *defaultPagingCycle*, a value of twoT corresponds to 2 * *defaultPagingCycle* and so on.
ul-Bandwidth Parameter: transmission bandwidth configuration, N_{RB}, in uplink, see TS 36.101 [42, table 5.6-1]. Value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If for FDD this parameter is absent, the uplink bandwidth is equal to the downlink bandwidth. For TDD this parameter is absent and it is equal to the downlink bandwidth.
ul-CarrierFreq For FDD: If absent, the (default) value determined from the default TX-RX frequency separation defined in TS 36.101 [42, table 5.7.3-1] applies. For TDD: This parameter is absent and it is equal to the downlink frequency.
UL-CyclicPrefixLength Parameter: Uplink cyclic prefix length see 36.211 [21, 5.2.1] where len1 corresponds to normal cyclic prefix and len2 corresponds to extended cyclic prefix.

Conditional presence	Explanation
TDD	The field is optional for TDD, Need ON; it is not present for FDD and the UE shall delete any existing value for this field.
TDD-OR	The field is optional for TDD, Need OR; it is not present for FDD and the UE shall delete any existing value for this field.

– *RadioResourceConfigDedicated*

The IE *RadioResourceConfigDedicated* is used to setup/modify/release RBs, to modify the MAC main configuration, to modify the SPS configuration and to modify dedicated physical configuration.

***RadioResourceConfigDedicated* information element**

```
-- ASN1START

RadioResourceConfigDedicated ::=        SEQUENCE {
    srb-ToAddModList                    SRB-ToAddModList            OPTIONAL,       -- Cond HO-Conn
    drb-ToAddModList                    DRB-ToAddModList            OPTIONAL,       -- Cond HO-
toEUTRA
    drb-ToReleaseList                   DRB-ToReleaseList           OPTIONAL,       -- Need ON
```

```
    mac-MainConfig                      CHOICE {
            explicitValue                   MAC-MainConfig,
            defaultValue                    NULL
    }       OPTIONAL,                                                       -- Cond HO-
toEUTRA2
    sps-Config                          SPS-Config                  OPTIONAL,       -- Need ON
    physicalConfigDedicated             PhysicalConfigDedicated     OPTIONAL,       -- Need ON
    ...,
    [[  rlf-TimersAndConstants-r9           RLF-TimersAndConstants-r9       OPTIONAL    -- Need ON
    ]]
}

RadioResourceConfigDedicatedSCell-r10 ::=   SEQUENCE {
    -- UE specific configuration extensions applicable for an SCell
    physicalConfigDedicated         PhysicalConfigDedicatedSCell-r10    OPTIONAL,   -- Need ON
    ...
}

SRB-ToAddModList ::=                SEQUENCE (SIZE (1..2)) OF SRB-ToAddMod

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

DRB-ToAddModList ::=                SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod

DRB-ToAddMod ::=    SEQUENCE {
    eps-BearerIdentity                  INTEGER (0..15)         OPTIONAL,       -- Cond DRB-Setup
    drb-Identity                        DRB-Identity,
    pdcp-Config                         PDCP-Config             OPTIONAL,       -- Cond PDCP
    rlc-Config                          RLC-Config              OPTIONAL,       -- Cond Setup
    logicalChannelIdentity              INTEGER (3..10)         OPTIONAL,       -- Cond DRB-Setup
    logicalChannelConfig                LogicalChannelConfig    OPTIONAL,       -- Cond Setup
    ...
}

DRB-ToReleaseList ::=               SEQUENCE (SIZE (1..maxDRB)) OF DRB-Identity

-- ASN1STOP
```

***RadioResourceConfigDedicated* field descriptions**
srb-Identity Value 1 is applicable for SRB1 only. Value 2 is applicable for SRB2 only.
rlc-Config For SRBs a choice is used to indicate whether the RLC configuration is signalled explicitly or set to the values defined in the default RLC configuration for SRB1 in 9.2.1.1 or for SRB2 in 9.2.1.2. RLC AM is the only applicable RLC mode for SRB1 and SRB2. E-UTRAN does not reconfigure the RLC mode of DRBs except when a full configuration option is used, and may reconfigure the UM RLC SN field size only upon handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment.
mac-MainConfig Although the ASN.1 includes a choice that is used to indicate whether the mac-MainConfig is signalled explictly or set to the default MAC main configuration as specified in 9.2.2, EUTRAN does not apply "*defaultValue*".
sps-Config The default SPS configuration is specified in 9.2.3.
physicalConfigDedicated The default dedicated physical configuration is specified in 9.2.4.
logicalChannelConfig For SRBs a choice is used to indicate whether the logical channel configuration is signalled explicitly or set to the default logical channel configuration for SRB1 as specified in 9.2.1.1 or for SRB2 as specified in 9.2.1.2.
logicalChannelIdentity The logical channel identity for both UL and DL.

Conditional presence	Explanation
DRB-Setup	The field is mandatory present if the corresponding DRB is being set up; otherwise it is not present.
PDCP	The field is mandatory present if the corresponding DRB is being setup; the field is optionally present, need ON, upon handover within E-UTRA and upon the first reconfiguration after re-establishment but in both these cases only when *fullConfig* is not included in the *RRCConnectionReconfiguration* message; otherwise it is not present.
Setup	The field is mandatory present if the corresponding SRB/DRB is being setup; otherwise the field is optionally present, need ON.
HO-Conn	The field is mandatory present in case of handover to E-UTRA or when the *fullConfig* is included in the *RRCConnectionReconfiguration* message or in case of RRC connection establishment; otherwise the field is optionally present, need ON. Upon connection establishment/ re-establishment only SRB1 is applicable.
HO-toEUTRA	The field is mandatory present in case of handover to E-UTRA or when the *fullConfig* is included in the *RRCConnectionReconfiguration* message; In case of RRC connection establishment and RRC connection re-establishment the field is not present; otherwise the field is optionally present, need ON.
HO-toEUTRA2	The field is mandatory present in case of handover to E-UTRA or when the *fullConfig* is included in the *RRCConnectionReconfiguration* message; otherwise the field is optionally present, need ON.

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– *SchedulingRequestConfig*

The IE *SchedulingRequestConfig* is used to specify the Scheduling Request related parameters

SchedulingRequestConfig information element

```
-- ASN1START

SchedulingRequestConfig ::=     CHOICE {
    release                             NULL,
    setup                               SEQUENCE {
        sr-PUCCH-ResourceIndex              INTEGER (0..2047),
        sr-ConfigIndex                      INTEGER (0..157),
        dsr-TransMax                        ENUMERATED {
                                                n4, n8, n16, n32, n64, spare3, spare2, spare1}
    }
}

SchedulingRequestConfig-v10x0 ::=   SEQUENCE {
    twoAntennaPortActivated-r10         ENUMERATED {true}               OPTIONAL,   -- Need OR
    sr-PUCCH-ResourceIndexP1-r10            INTEGER (0..2047)               OPTIONAL        -- Cond
FFS
}

-- ASN1STOP
```

***SchedulingRequestConfig* field descriptions**
sr-PUCCH-ResourceIndex
Parameter: $n^{(1,p)}_{\mathrm{PUCCH,SRI}}$ for antenna port P0, see TS 36.213 [23, 10.1].
twoAntennaPortActivated
Parameter and reference tbd.
sr-PUCCH-ResourceIndexP1
Parameter: $n^{(1,p)}_{\mathrm{PUCCH,SRI}}$ for antenna port P1, see TS 36.213 [23, 10.1].
sr-ConfigIndex
Parameter I_{SR}. See TS 36.213 [23,10.1]. The values 156 and 157 are not applicable for Release 8.
dsr-TransMax
Parameter for SR transmission in TS 36.321 [6, 5.4.4]. The value n4 corresponds to 4 transmissions, n8 corresponds to 8 transmissions and so on.

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– *SoundingRS-UL-Config*

The IE *SoundingRS-UL-Config* is used to specify the uplink Sounding RS configuration for periodic and aperiodic sounding.

SoundingRS-UL-Config information element

```
-- ASN1START

SoundingRS-UL-ConfigCommon ::=      CHOICE {
    release                             NULL,
    setup                               SEQUENCE {
        srs-BandwidthConfig                 ENUMERATED {bw0, bw1, bw2, bw3, bw4, bw5, bw6, bw7},
        srs-SubframeConfig                  ENUMERATED {
                                                sc0, sc1, sc2, sc3, sc4, sc5, sc6, sc7,
                                                sc8, sc9, sc10, sc11, sc12, sc13, sc14, sc15},
        ackNackSRS-SimultaneousTransmission BOOLEAN,
        srs-MaxUpPts                        ENUMERATED {true}           OPTIONAL    -- Cond TDD
    }
}

SoundingRS-UL-ConfigDedicated ::=   CHOICE{
    release                             NULL,
    setup                               SEQUENCE {
        srs-Bandwidth                       ENUMERATED {bw0, bw1, bw2, bw3},
        srs-HoppingBandwidth                ENUMERATED {hbw0, hbw1, hbw2, hbw3},
        freqDomainPosition                  INTEGER (0..23),
        duration                            BOOLEAN,
        srs-ConfigIndex                     INTEGER (0..1023),
        transmissionComb                    INTEGER (0..1),
        cyclicShift                         ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
    }
}

SoundingRS-UL-ConfigDedicated-v10x0 ::= SEQUENCE {
    srs-AntennaPort-r10                 ENUMERATED {an1, an2, an4, spare1}
}

SoundingRS-UL-ConfigDedicatedAperiodic-r10 ::=   CHOICE{
-- It is still FFS whether or not this IE will be introduced
    release                             NULL,
    setup                               SEQUENCE {
        srs-AntennaPortAp-r10               ENUMERATED {an1, an2, an4, spare1},
        srs-BandwidthAp-r10                 ENUMERATED {bw0, bw1, bw2, bw3},
        srs-HoppingBandwidthAp-r10          ENUMERATED {hbw0, hbw1, hbw2, hbw3},
        freqDomainPositionAp-r10            INTEGER (0..23),
        transmissionCombAp-r10              INTEGER (0..1),
        cyclicShiftAp-r10                   ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
    }
}                                                                               -- All value ranges FFS

-- ASN1STOP
```

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***SoundingRS-UL-Config* field descriptions**
srs-BandwidthConfig Parameter: SRS Bandwidth Configuration. See TS 36.211, [21, table 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2– 4]. Actual configuration depends on UL bandwidth. bw0 corresponds to value 0, bw1 to value 1 and so on.
srs-SubframeConfig Parameter: SRS SubframeConfiguration. See TS 36.211, [21, table 5.5.3.3-1] applies for FDD whereas TS 36.211, [21, table 5.5.3.3-2] applies for TDD. sc0 corresponds to value 0, sc1 to value 1 and so on.
ackNackSRS-SimultaneousTransmission Parameter: *Simultaneous-AN-and-SRS*, see TS 36.213 [23, 8.2]. For SCells this field is not applicable and the UE shall ignore the value.
srs-Bandwidth Parameter: B_{SRS}, see TS 36.211 [21, tables 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2-4].
freqDomainPosition Parameter: n_{RRC}, see TS 36.211 [21, 5.5.3.2].
srs-HoppingBandwidth Parameter: SRS hopping bandwidth $b_{hop} \in \{0,1,2,3\}$, see TS 36.211 [21, 5.5.3.2] where hbw0 corresponds to value 0, hbw1 to value 1 and so on.
duration Parameter: Duration. See TS 36.213 [21, 8.2]. FALSE corresponds to "single" and value TRUE to "indefinite".
srs-ConfigIndex Parameter: I_{SRS}. See TS 36.213 [23, table8.2-1].
transmissionComb Parameter: $k_{\mathrm{TC}} \in \{0,1\}$, see TS 36.211 [21, 5.5.3.2].
cyclicShift Parameter: n_SRS. See TS 36.211 [21, 5.5.3.1], where cs0 corresponds to 0 etc.
srs-MaxUpPts Parameter: srsMaxUpPts, see TS 36.211 [21, 5.5.3.2]. If this field is present, reconfiguration of $m_{\mathrm{SRS},0}^{\max}$ applies for UpPts, otherwise reconfiguration does not apply.
srs-AntennaPort parameter: srs-AntennaPorts, see TS 36.211 [21, tbd].
srs-AntennaPortAp parameter: srs-AntennaPorts-ap, see TS 36.211 [21, tbd].

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Conditional presence	Explanation
TDD	This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.

– *SPS-Config*

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

***SPS-Config* information element**

```
-- ASN1START

SPS-Config ::=  SEQUENCE {
    semiPersistSchedC-RNTI          C-RNTI                  OPTIONAL,           -- Need OR
    sps-ConfigDL                    SPS-ConfigDL            OPTIONAL,           -- Need ON
    sps-ConfigUL                    SPS-ConfigUL            OPTIONAL            -- Need ON
}

SPS-ConfigDL ::=    CHOICE{
    release                         NULL,
    setup                           SEQUENCE {
        semiPersistSchedIntervalDL          ENUMERATED {
                                                sf10, sf20, sf32, sf40, sf64, sf80,
                                                sf128, sf160, sf320, sf640, spare6,
                                                spare5, spare4, spare3, spare2,
                                                spare1},
        numberOfConfSPS-Processes           INTEGER (1..8),
        n1-PUCCH-AN-PersistentList          N1-PUCCH-AN-PersistentList,
        ...,
        [[  twoAntennaPortActivated-r10         ENUMERATED {true}           OPTIONAL,   -- Need OR
```

```
            n1-PUCCH-AN-PersistentListP1-r10        N1-PUCCH-AN-PersistentList  OPTIONAL    -- Cond
FFS
        ]]
    }
}

SPS-ConfigUL ::=    CHOICE {
    release                         NULL,
    setup                           SEQUENCE {
        semiPersistSchedIntervalUL          ENUMERATED {
                                                sf10, sf20, sf32, sf40, sf64, sf80,
                                                sf128, sf160, sf320, sf640, spare6,
                                                spare5, spare4, spare3, spare2,
                                                spare1},
        implicitReleaseAfter                ENUMERATED {e2, e3, e4, e8},
        p0-Persistent                       SEQUENCE {
            p0-NominalPUSCH-Persistent          INTEGER (-126..24),
            p0-UE-PUSCH-Persistent              INTEGER (-8..7)
        }       OPTIONAL,                                       -- Need OP
        twoIntervalsConfig                  ENUMERATED {true}           OPTIONAL,   -- Cond TDD
        ...
    }
}

N1-PUCCH-AN-PersistentList ::=      SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)

-- ASN1STOP
```

***SPS-Config* field descriptions**
semiPersistSchedC-RNTI Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].
semiPersistSchedIntervalDL Semi-persistent scheduling interval in downlink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames.
numberOfConfSPS-Processes The number of configured HARQ processes for Semi-Persistent Scheduling, see TS 36.321 [6].
n1-PUCCH-AN-PersistentList List of parameter: $n_{\mathrm{PUCCH}}^{(1,p)}$ for antenna port P0, see TS 36.213 [23, 10.1].
twoAntennaPortActivated Parameter and reference tbd.
n1-PUCCH-AN-PersistentListP1 List of parameter: $n_{\mathrm{PUCCH}}^{(1,p)}$ for antenna port P1, see TS 36.213 [23, 10.1].
semiPersistSchedIntervalUL Semi-persistent scheduling interval in uplink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames.
implicitReleaseAfter Number of empty transmissions before implicit release, see TS 36.321 [6, 5.10.2]. Value e2 corresponds to 2 transmissions, e3 corresponds to 3 transmissions and so on.
p0-NominalPUSCH-Persistent Parameter: $P_{\mathrm{O\_NOMINAL\_PUSCH}}(0)$. See TS 36.213 [23, 5.1.1.1], unit dBm step 1. This field is applicable for persistent scheduling, only. If choice 'setup' is used and *p0-Persistent* is absent, apply the value of *p0-NominalPUSCH* for *p0-NominalPUSCH-Persistent.*
p0-UE-PUSCH-Persistent Parameter: $P_{\mathrm{O\_UE\_PUSCH}}(0)$. See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for persistent scheduling, only. If choice 'setup' is used and *p0-Persistent* is absent, apply the value of p0-UE-PUSCH for *p0-UE-PUSCH-Persistent.*
twoIntervalsConfig Trigger of two-intervals-Semi-Persistent Scheduling in uplink. See TS 36.321 [6, 5.10]. If this field is present, two-intervals-SPS is enabled for uplink. Otherwise, two-intervals-SPS is disabled.

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Conditional presence	Explanation
TDD	This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.

– *TDD-Config*

The IE *TDD-Config* is used to specify the TDD specific physical channel configuration. The (same) configuration applies for all serving cells i.e. for the PCell as well as for SCells, if configured.

TDD-Config information element

```
-- ASN1START

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

-- ASN1STOP
```

***TDD-Config* field descriptions**
subframeAssignment
Indicates DL/UL subframe configuration where sa0 point to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2.2].
specialSubframePatterns
Indicates Configuration as in TS 36.211 [21, table 4.2.1] where ssp0 point to Configuration 0, ssp1 to Configuration 1 etc.

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– *TimeAlignmentTimer*

The IE *TimeAlignmentTimer* is used to control how long the UE is considered uplink time aligned. Corresponds to the Timer for time alignment in TS 36.321 [6]. Value in number of sub-frames. Value sf500 corresponds to 500 sub-frames, sf750 corresponds to 750 sub-frames and so on. In this release of the specification, uplink time alignment is common for all serving cells.

TimeAlignmentTimer information element

```
-- ASN1START

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

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– *UL-AntennaInfo*

The IE *UL-AntennaInfo* is used to specify the UL antenna configuration.

UL-AntennaInfo information elements

```
-- ASN1START

UL-AntennaInfo-r10 ::=      SEQUENCE {
    ul-TransmissionMode-r10             ENUMERATED {tm1, tm2, spare6, spare5,
                                                    spare4, spare3, spare2, spare1},
    -- FFS whether the fourAntennaPortActivated is a UE specific or cell specific parameter
    fourAntennaPortActivated-r10            BOOLEAN,
```

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```
    ...
}                                                   -- Value ranges and additional parameters FFS

-- ASN1STOP
```

***UL-AntennaInfo* field descriptions**
ul-TransmissionMode
Points to one of UL Transmission modes defined in TS 36.213 [23, 8] where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.
fourAntennaPortActivated
Parameter and reference tbd.

– *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)
}

UplinkPowerControlCommon-v10x0 ::=  SEQUENCE {
    deltaF-PUCCH-Format3-r10                ENUMERATED {FFS}
}

UplinkPowerControlCommonSCell-r10 ::=   SEQUENCE {
    p0-NominalPUSCH-r10                 INTEGER (-126..24),
    alpha-r10                           ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1}
}

UplinkPowerControlDedicated ::=     SEQUENCE {
    p0-UE-PUSCH                         INTEGER (-8..7),
    deltaMCS-Enabled                    ENUMERATED {en0, en1},
    accumulationEnabled                 BOOLEAN,
    p0-UE-PUCCH                         INTEGER (-8..7),
    pSRS-Offset                         INTEGER (0..15),
    filterCoefficient                   FilterCoefficient                   DEFAULT fc4
}

UplinkPowerControlDedicatedSCell-r10 ::=        SEQUENCE {
    p0-UE-PUSCH-r10                     INTEGER (-8..7),
    deltaMCS-Enabled-r10                    ENUMERATED {en0, en1},
    accumulationEnabled-r10             BOOLEAN,
    pSRS-Offset-r10                     INTEGER (0..15),
    filterCoefficient-r10               FilterCoefficient                   DEFAULT fc4,
    pathlossReference-r10               ENUMERATED {pCell, sCell}
}

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

-- ASN1STOP
```

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UplinkPowerControl field descriptions
p0-NominalPUSCH Parameter: $P_{O\_NOMINAL\_PUSCH}(1)$ See TS 36.213, 5.1.1.1, unit dBm. This field is applicable for non-persistent scheduling, only.
alpha Parameter: *α* See TS 36.213, 5.1.1.1 where al0 corresponds to 0, al04 corresponds to value 0.4, al05 to 0.5, al06 to 0.6, al07 to 0.7, al08 to 0.8, al09 to 0.9 and al1 corresponds to 1.
p0-NominalPUCCH Parameter: $P_{O\_NOMINAL\_PUCCH}$ See TS 36.213, 5.1.2.1, unit dBm.
deltaF-PUCCH-FormatX Parameter: $\Delta_{F\_PUCCH}(F)$ for the PUCCH formats 1, 1b, 2, 2a, 2b and 3. See TS 36.213 [23, 5.1.2] where deltaF-2 corresponds to -2 dB, deltaF0 corresponds to 0 dB and so on.
p0-UE-PUSCH Parameter: $P_{O\_UE\_PUSCH}(1)$ See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for non-persistent scheduling, only.
deltaPreambleMsg3 Parameter: $\Delta_{PREAMBLE\_Msg3}$ *see* TS 36.213 [23, 5.1.1.1]. Actual value = IE value * 2 [dB].
deltaMCS-Enabled Parameter: *Ks* See TS 36.213 [23, 5.1.1.1]. en0 corresponds to value 0 corresponding to state “disabled”. en1 corresponds to value 1.25 corresponding to “enabled”.
accumulationEnabled Parameter: Accumulation-enabled, see TS 36.213 [23, 5.1.1.1]. TRUE corresponds to “enabled” whereas FALSE corresponds to “disabled”.
p0-UE-PUCCH Parameter: $P_{O\_UE\_PUCCH}$ See TS 36.213 [23, 5.1.2.1]. Unit dB
pSRS-Offset Parameter: P_{SRS_OFFSET} See TS 36.213 [23, 5.1.3.1]. For Ks=1.25, the actual parameter value is pSRS-Offset value – 3. For Ks=0, the actual parameter value is -10.5 + 1.5*pSRS-Offset value.
pathlossReference Indicates whether the UE shall apply as pathloss reference either the downlink of the PCell or of the SCell that corresponds with this uplink (i.e. according to the *cellIdentification* within the field *sCellToAddMod*).
filterCoefficient Specifies the filtering coefficient for RSRP measurements used to calculate path loss, as specified in TS 36.213 [23, 5.1.1.1]. The same filtering mechanism applies as for *quantityConfig* described in 5.5.3.2.

6.3.4 Mobility control information elements

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– *CellIndexList*

The IE *CellIndexList* concerns a list of cell indices, which may be used for different purposes.

***CellIndexList* information element**

```
-- ASN1START

CellIndexList ::=                   SEQUENCE (SIZE (1..maxCellMeas)) OF CellIndex

CellIndex ::=                       INTEGER (1..maxCellMeas)

-- ASN1STOP
```

– *SCellIndex*

The IE *SCellIndex* concerns a short identity, used to identify an SCell.

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***SCellIndex* information element**

```
-- ASN1START

SCellIndex-r10 ::=                  INTEGER (1..7)

-- ASN1STOP
```

– *ServCellIndex*

The IE *ServCellIndex* concerns a short identity, used to identify a serving cell (i.e. the PCell or an SCell). Value 0 applies for the PCell, while the SCellIndex that has previously been assigned applies for SCells.

***ServCellIndex* information element**

```
-- ASN1START

ServCellIndex-r10 ::=               INTEGER (0..7)

-- ASN1STOP
```

6.3.5 Measurement information elements

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– *MeasConfig*

The IE *MeasConfig* specifies measurements to be performed by the UE, and covers intra-frequency, inter-frequency and inter-RAT mobility as well as configuration of measurement gaps.

***MeasConfig* information element**

```
-- ASN1START

MeasConfig ::=                  SEQUENCE {
    -- Measurement objects
    measObjectToRemoveList          MeasObjectToRemoveList          OPTIONAL,   -- Need ON
    measObjectToAddModList          MeasObjectToAddModList          OPTIONAL,   -- Need ON
    -- Reporting configurations
    reportConfigToRemoveList        ReportConfigToRemoveList        OPTIONAL,   -- Need ON
    reportConfigToAddModList        ReportConfigToAddModList        OPTIONAL,   -- Need ON
    -- Measurement identities
    measIdToRemoveList              MeasIdToRemoveList              OPTIONAL,   -- Need ON
    measIdToAddModList              MeasIdToAddModList              OPTIONAL,   -- Need ON
    -- Other parameters
    quantityConfig                  QuantityConfig                  OPTIONAL,   -- Need ON
    measGapConfig                   MeasGapConfig                   OPTIONAL,   -- Need ON
    s-Measure                       RSRP-Range                      OPTIONAL,   -- Need ON
    preRegistrationInfoHRPD         PreRegistrationInfoHRPD         OPTIONAL,   -- Need OP
    speedStatePars          CHOICE {
        release                         NULL,
        setup                           SEQUENCE {
            mobilityStateParameters         MobilityStateParameters,
            timeToTrigger-SF                SpeedStateScaleFactors
        }
    }                                                               OPTIONAL,   -- Need ON
    ...
}

MeasIdToRemoveList ::=          SEQUENCE (SIZE (1..maxMeasId)) OF MeasId

MeasObjectToRemoveList ::=      SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectId

ReportConfigToRemoveList ::=    SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigId

-- ASN1STOP
```

***MeasConfig* field descriptions**
measObjectToRemoveList List of measurement objects to remove.
reportConfigToRemoveList List of measurement reporting configurations to remove.
measIdToRemoveList List of measurement identities to remove.
measGapConfig Used to setup and release measurement gaps.
s-Measure PCell quality threshold controlling whether or not the UE is required to perform measurements of intra-frequency, inter-frequency and inter-RAT neighbouring cells. Value "0" indicates to disable *s-Measure*.
PreRegistrationInfoHRPD The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.
timeToTrigger-SF The *timeToTrigger* in *ReportConfigEUTRA* and in *ReportConfigInterRAT* are multiplied with the scaling factor applicable for the UE's speed state.

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– *MeasObjectEUTRA*

The IE *MeasObjectEUTRA* specifies information applicable for intra-frequency or inter-frequency E-UTRA neighbouring cells.

***MeasObjectEUTRA* information element**

```
-- ASN1START

MeasObjectEUTRA ::=                 SEQUENCE {
    carrierFreq                         ARFCN-ValueEUTRA,
    allowedMeasBandwidth                AllowedMeasBandwidth,
    presenceAntennaPort1                PresenceAntennaPort1,
    neighCellConfig                     NeighCellConfig,
    offsetFreq                          Q-OffsetRange               DEFAULT dB0,
    -- Neighbour cell list
    cellsToRemoveList                   CellIndexList               OPTIONAL,       -- Need ON
    cellsToAddModList                   CellsToAddModList           OPTIONAL,       -- Need ON
    -- Black list
    blackCellsToRemoveList              CellIndexList               OPTIONAL,       -- Need ON
    blackCellsToAddModList              BlackCellsToAddModList      OPTIONAL,       -- Need ON
    cellForWhichToReportCGI             PhysCellId                  OPTIONAL,       -- Need ON
    ...
}

CellsToAddModList ::=               SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod

CellsToAddMod ::=   SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),
    physCellId                          PhysCellId,
    cellIndividualOffset                Q-OffsetRange
}

BlackCellsToAddModList ::=          SEQUENCE (SIZE (1..maxCellMeas)) OF BlackCellsToAddMod

BlackCellsToAddMod ::=  SEQUENCE {
    cellIndex                           INTEGER (1..maxCellMeas),
    physCellIdRange                     PhysCellIdRange
}

-- ASN1STOP
```

***MeasObjectEUTRA* field descriptions**
carrierFreq Identifies E-UTRA carrier frequency for which this configuration is valid.
offsetFreq Offset value applicable to the carrier frequency. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
cellsToRemoveList List of cells to remove from the neighbouring cell list.
cellsToAddModList List of cells to add/ modify in the neighbouring cell list.
cellIndex Entry index in the neighbouring cell list. An entry may concern a range of cells, in which case this value applies to the entire range.
physCellId Physical cell identity of a cell in neighbouring cell list.
cellIndividualOffset Cell individual offset applicable to a specific neighbouring cell. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.
blackCellsToRemoveList List of cells to remove from the black list of cells.
blackCellsToAddMoList List of cells to add/ modify in the black list of cells.
physCellIdRange Physical cell identity or a range of physical cell identities of cells in the black list.

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– *MeasResults*

The IE *MeasResults* covers measured results for intra-frequency, inter-frequency and inter- RAT mobility.

***MeasResults* information element**

```
-- ASN1START

MeasResults ::=                     SEQUENCE {
    measId                              MeasId,
    measResultPCell                     SEQUENCE {
        rsrpResult                          RSRP-Range,
        rsrqResult                          RSRQ-Range
    },
    measResultNeighCells                CHOICE {
        measResultListEUTRA                 MeasResultListEUTRA,
        measResultListUTRA                  MeasResultListUTRA,
        measResultListGERAN                 MeasResultListGERAN,
        measResultsCDMA2000                 MeasResultsCDMA2000,
        ...
    }                                                                   OPTIONAL,
    ...,
    [[  measResultForECID-r9                MeasResultForECID-r9        OPTIONAL
    ]],
    [[  measResultServFreqList-r10          MeasResultServFreqList-r10  OPTIONAL
    ]]
}

MeasResultListEUTRA ::=             SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA

MeasResultEUTRA ::= SEQUENCE {
    physCellId                          PhysCellId,
    cgi-Info                            SEQUENCE {
        cellGlobalId                        CellGlobalIdEUTRA,
        trackingAreaCode                    TrackingAreaCode,
        plmn-IdentityList                   PLMN-IdentityList2          OPTIONAL
    }                                                           OPTIONAL,
    measResult                          SEQUENCE {
        rsrpResult                          RSRP-Range                  OPTIONAL,
        rsrqResult                          RSRQ-Range                  OPTIONAL,
        ...,
        [[  additionalSI-Info-r9                AdditionalSI-Info-r9            OPTIONAL
        ]]
    }
```

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}

MeasResultServFreqList-r10 ::=  SEQUENCE (SIZE (1..maxServCell-r10)) OF MeasResultServFreq-r10

MeasResultServFreq-r10 ::=          SEQUENCE {
    servFreqId                          ServCellIndex-r10,
    measResultSCell                     SEQUENCE {
        rsrpResultSCell                     RSRP-Range,
        rsrqResultSCell                     RSRQ-Range
    }                                                       OPTIONAL,
    measResultBestNeighCell         SEQUENCE {
        physCellId                          PhysCellId,
        rsrpResultNCell                     RSRP-Range,
        rsrqResultNCell                     RSRQ-Range
    }                                                       OPTIONAL,
    ...
}

MeasResultListUTRA ::=              SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA

MeasResultUTRA ::=  SEQUENCE {
    physCellId                          CHOICE {
        fdd                                 PhysCellIdUTRA-FDD,
        tdd                                 PhysCellIdUTRA-TDD
    },
    cgi-Info                            SEQUENCE {
        cellGlobalId                        CellGlobalIdUTRA,
        locationAreaCode                    BIT STRING (SIZE (16))          OPTIONAL,
        routingAreaCode                     BIT STRING (SIZE (8))           OPTIONAL,
        plmn-IdentityList                   PLMN-IdentityList2              OPTIONAL
    }                                                       OPTIONAL,
    measResult                          SEQUENCE {
        utra-RSCP                           INTEGER (-5..91)                OPTIONAL,
        utra-EcN0                           INTEGER (0..49)                 OPTIONAL,
        ...,
        [[  additionalSI-Info-r9                AdditionalSI-Info-r9                OPTIONAL
        ]]
    }
}

MeasResultListGERAN ::=             SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultGERAN

MeasResultGERAN ::= SEQUENCE {
    carrierFreq                         CarrierFreqGERAN,
    physCellId                          PhysCellIdGERAN,
    cgi-Info                            SEQUENCE {
        cellGlobalId                        CellGlobalIdGERAN,
        routingAreaCode                     BIT STRING (SIZE (8))           OPTIONAL
    }                                                       OPTIONAL,
    measResult                          SEQUENCE {
        rssi                                INTEGER (0..63),
        ...
    }
}

MeasResultsCDMA2000 ::=             SEQUENCE {
    preRegistrationStatusHRPD           BOOLEAN,
    measResultListCDMA2000              MeasResultListCDMA2000
}

MeasResultListCDMA2000 ::=          SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCDMA2000

MeasResultCDMA2000 ::=  SEQUENCE {
    physCellId                          PhysCellIdCDMA2000,
    cgi-Info                            CellGlobalIdCDMA2000                OPTIONAL,
    measResult                          SEQUENCE {
        pilotPnPhase                        INTEGER (0..32767)              OPTIONAL,
        pilotStrength                       INTEGER (0..63),
        ...
    }
}

MeasResultForECID-r9 ::=        SEQUENCE {
    ue-RxTxTimeDiffResult-r9            INTEGER (0..4095),
    currentSFN-r9                       BIT STRING (SIZE (10))
}

PLMN-IdentityList2 ::=              SEQUENCE (SIZE (1..5)) OF PLMN-Identity
```

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```
AdditionalSI-Info-r9 ::=            SEQUENCE {
    csg-MemberStatus-r9             ENUMERATED {member}             OPTIONAL,
    csg-Identity-r9                     CSG-Identity                        OPTIONAL
}

-- ASN1STOP
```

***MeasResults* field descriptions**
measId Identifies the measurement identity for which the reporting is being performed.
measResultPCell Measured result of the PCell.
MeasResultServFreqList Measured results of the serving frequencies: the measurement result of each SCell, if any, and of the best neighbouring cell on each serving frequency. For the frequency indicated in the *measObject* associated with this measurement, the best neighbouring cell is not included in the list. For each cell that is included the UE provides the layer 3 filtered measurement results.
measResultListEUTRA List of measured results for the maximum number of reported best cells for an E-UTRA measurement identity.
rsrpResult Measured RSRP result of an E-UTRA cell. The rsrpResult is only reported if configured by the eNB.
rsrqResult Measured RSRQ result of an E-UTRA cell. The rsrqResult is only reported if configured by the eNB.
measResultListUTRA List of measured results for the maximum number of reported best cells for a UTRA measurement identity.
measResultListGERAN List of measured results for the maximum number of reported best cells or frequencies for a GERAN measurement identity.
measResultsCDMA2000 Contains the CDMA2000 HRPD pre-registration status and the list of CDMA2000 measurements.
preRegistrationStatusHRPD Set to TRUE if the UE is currently pre-registered with CDMA2000 HRPD. Otherwise set to FALSE. This can be ignored by the eNB for CDMA2000 1xRTT.

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***MeasResults* field descriptions**
measResultListCDMA2000 List of measured results for the maximum number of reported best cells for a CDMA2000 measurement identity.
measResult Measured result of an E-UTRA cell; Measured result of a UTRA cell; Measured result of a GERAN cell or frequency; or Measured result of a CDMA2000 cell. Measured result of UE Rx – Tx time difference.
utra-RSCP According to CPICH_RSCP in TS 25.133 [29] for FDD and P-CCPCH_RSCP in TS 25.123 [30] for TDD. Thirty-one spare values.
utra-EcN0 According to CPICH_Ec/No in TS 25.133 [29] for FDD. Fourteen spare values. The field is not present for TDD.
rssi GERAN Carrier RSSI. RXLEV is mapped to a value between 0 and 63, TS 45.008 [28]. When mapping the RXLEV value to the RSSI bit string, the first/leftmost bit of the bit string contains the most significant bit.
locationAreaCode A fixed length code identifying the location area within a PLMN, as defined in TS 23.003 [27].
routingAreaCode The RAC identity read from broadcast information, as defined in TS 23.003 [27].
plmn-IdentityList The list of PLMN Identity read from broadcast information when the multiple PLMN Identities are broadcast. This field contains the list of identities starting from the second entry of PLMN Identities in the broadcast information.
pilotPnPhase Indicates the arrival time of a CDMA2000 pilot, measured relative to the UE's time reference in units of PN chips, see C.S0005-A [25]. This information is used in either SRVCC handover or enhanced 1xRTT CS fallback procedure to CDMA2000 1xRTT.
pilotStrength CDMA2000 Pilot Strength, the ratio of pilot power to total power in the signal bandwidth of a CDMA2000 Forward Channel. See C.S0005-A [25] for CDMA2000 1xRTT and C.S0024-A [26] for CDMA2000 HRPD.
csg-MemberStatus Indicates whether or not the UE is a member of the CSG of the neighbour cell.
ue-RxTxTimeDiffResult UE Rx-Tx time difference measurement result of the PCell, provided by lower layers. According to UE Rx-Tx time difference report mapping in TS 36.133 [16].
currentSFN Indicates the current system frame number when receiving the UE Rx-Tx time difference measurement results from lower layer.

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– *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 PCell;

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Event A4: Neighbour becomes better than absolute threshold;

Event A5: PCell becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

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Event A6: Neighbour becomes amount of offset better than SCell.

***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
                },
                ...,
                eventA6                             SEQUENCE {
                    a6-Offset                           INTEGER (-30..30),
                    a6-ReportOnLeave                    BOOLEAN
                }
            },
            hysteresis                          Hysteresis,
            timeToTrigger                       TimeToTrigger
        },
        periodical                              SEQUENCE {
            purpose                                 ENUMERATED {
                                                        reportStrongestCells, reportCGI}
        }
    },
    triggerQuantity                     ENUMERATED {rsrp, rsrq},
    reportQuantity                      ENUMERATED {sameAsTriggerQuantity, both},
    maxReportCells                      INTEGER (1..maxCellReport),
    reportInterval                      ReportInterval,
    reportAmount                        ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
    ...,
    [[  si-RequestForHO-r9                  ENUMERATED {setup}      OPTIONAL,   -- Cond reportCGI
        ue-RxTxTimeDiffPeriodical-r9        ENUMERATED {setup}      OPTIONAL    -- Need OR
    ]],
    [[  reportAddNeighMeas-r10              ENUMERATED {setup}      OPTIONAL    -- Need OR
    ]]
}

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/ a6-Offset Offset value to be used in EUTRA measurement report triggering condition for event a3/ a6. The actual value is IE value * 0.5 dB.
reportOnLeave/ a6-ReportOnLeave Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a cell in *cellsTriggeredList*, as specified in 5.5.4.1.
triggerQuantity The quantities used to evaluate the triggering condition for the event. The values rsrp and rsrq correspond to Reference Signal Received Power (RSRP) and Reference Signal Received Quality (RSRQ), see TS 36.214 [48].
timeToTrigger Time during which specific criteria for the event needs to be met in order to trigger a measurement report.
reportQuantity The quantities to be included in the measurement report. The value both means that both the rsrp and rsrq quantities are to be included in the measurement report.
maxReportCells Max number of cells, excluding the serving cell, to include in the measurement report.
reportAmount Number of measurement reports applicable for *triggerType* '*event*' as well as for *triggerType* '*periodical*'. In case *purpose* is set to '*reportCGI*' only value 1 applies.
ThresholdEUTRA For RSRP: RSRP based threshold for event evaluation. The actual value is IE value – 140 dBm. For RSRQ: RSRQ based threshold for event evaluation. The actual value is (IE value – 40)/2 dB.
si-RequestForHO The field applies to the '*reportCGI*' functionality, and when the field is included, the UE is allowed to use autonomous gaps in acquiring system information from the neighbour cell, applies a different value for T321, and includes different fields in the measurement report.
ue-RxTxTimeDiffPeriodical If this field is present, the UE shall perform UE Rx-Tx time difference measurement reporting and ignore the fields *triggerQuantity*, *reportQuantity* and *maxReportCells*. If the field is present, the only applicable values for the corresponding *triggerType* and *purpose* are 'periodical' and 'reportStrongestCells' respectively.

Conditional presence	Explanation
reportCGI	The field is optional, need OR, in case '*purpose*' is included and set to '*reportCGI*'; otherwise the field is not present.

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– *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: PCell becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

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The b1 and b2 event thresholds for CDMA2000 are the CDMA2000 pilot detection thresholds are expressed as an unsigned binary number equal to [-2 x 10 log 10 E_c/I_o] in units of 0.5dB, see C.S0005-A [25] for details.

***ReportConfigInterRAT* information element**

```
-- ASN1START

ReportConfigInterRAT ::=            SEQUENCE {
    triggerType                         CHOICE {
        event                               SEQUENCE {
            eventId                             CHOICE {
                eventB1                             SEQUENCE {
                    b1-Threshold                        CHOICE {
```

```
                    b1-ThresholdUTRA                    ThresholdUTRA,
                    b1-ThresholdGERAN                   ThresholdGERAN,
                    b1-ThresholdCDMA2000                ThresholdCDMA2000
                }
            },
            eventB2                             SEQUENCE {
                b2-Threshold1                       ThresholdEUTRA,
                b2-Threshold2                       CHOICE {
                    b2-Threshold2UTRA                   ThresholdUTRA,
                    b2-Threshold2GERAN                  ThresholdGERAN,
                    b2-Threshold2CDMA2000               ThresholdCDMA2000
                }
            },
            ...
        },
        hysteresis                      Hysteresis,
        timeToTrigger                   TimeToTrigger
    },
    periodical                              SEQUENCE {
        purpose                                 ENUMERATED {
                                                    reportStrongestCells,
                                                    reportStrongestCellsForSON,
                                                    reportCGI}
    }
},
maxReportCells                      INTEGER (1..maxCellReport),
reportInterval                      ReportInterval,
reportAmount                        ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
...,
[[  si-RequestForHO-r9                  ENUMERATED {setup}      OPTIONAL    -- Cond reportCGI
]]
}

ThresholdUTRA ::=                   CHOICE{
    utra-RSCP                           INTEGER (-5..91),
    utra-EcN0                           INTEGER (0..49)
}

ThresholdGERAN ::=              INTEGER (0..63)

ThresholdCDMA2000 ::=           INTEGER (0..63)

-- ASN1STOP
```

ReportConfigInterRAT field descriptions
eventId Choice of inter-RAT event triggered reporting criteria.

bN-ThresholdM
Threshold to be used in inter RAT measurement report triggering condition for event number bN. If multiple thresholds are defined for event number bN, the thresholds are differentiated by M.

timeToTrigger Time during which specific criteria for the event needs to be met in order to trigger a measurement report.
Purpose reportStrongestCellsForSON applies only in case *reportConfig* is linked to a *measObject* set to '*measObjectUTRA*' or '*measObjectCDMA2000*'.
maxReportCells Max number of cells, excluding the serving cell, to include in the measurement report. In case *purpose* is set to '*reportStrongestCellsForSON*' only value 1 applies.
reportAmount Number of measurement reports applicable for *triggerType* '*event*' as well as for *triggerType* '*periodical*'. In case *purpose* is set to '*reportCGI*' or 'reportStrongestCellsForSON' only value 1 applies.

ThresholdUTRA
utra-RSCP corresponds to CPICH_RSCP in TS 25.133 [29] for FDD and P-CCPCH_RSCP in TS 25.123 [30] for TDD.
utra-EcN0 corresponds to CPICH_Ec/No in TS 25.133 [29] for FDD, and is not applicable for TDD.
For *utra-RSCP*: The actual value is IE value – 115 dBm.
For *utra-EcN0*: The actual value is (IE value – 49)/2 dB.
ThresholdGERAN
The actual value is IE value – 110 dBm.
si-RequestForHO
The field applies to the '*reportCGI*' functionality, and when the field is included, the UE is allowed to use autonomous gaps in acquiring system information from the neighbour cell, applies a different value for T321, and includes different fields in the measurement report.

Conditional presence	Explanation
reportCGI	The field is optional, need OR, in case '*purpose*' is included and set to '*reportCGI*'; otherwise the field is not present.

6.3.6 Other information elements

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– *NeighCellConfig*

The IE *NeighCellConfig* is used to provide the information related to MBSFN and TDD UL/DL configuration of neighbour cells.

***NeighCellConfig* information element**

```
-- ASN1START

NeighCellConfig ::=         BIT STRING (SIZE (2))

-- ASN1STOP
```

NeighCellConfig field descriptions
neighCellConfig Provides information related to MBSFN and TDD UL/DL configuration of neighbour cells of this frequency 00: Not all neighbour cells have the same MBSFN subframe allocation as the serving cell on this frequency, if configured, and as the PCell otherwise 10: The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise 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 on this frequency, if configured, and compared to the PCell otherwise For TDD, 00, 10 and 01 are only used for same UL/DL allocation in neighbouring cells compared to the serving cell on this frequency, if configured, and compared to the PCell otherwise.

6.4 RRC multiplicity and type constraint values

– Multiplicity and type constraint definitions

```
-- ASN1START

maxBands                    INTEGER ::= 64  -- Maximum number of bands listed in EUTRA UE caps
maxCDMA-BandClass           INTEGER ::= 32  -- Maximum value of the CDMA band classes
maxCellBlack                INTEGER ::= 16  -- Maximum number of blacklisted cells
                                            --  listed in SIB type 4 and 5
maxCellInfoGERAN-r9         INTEGER ::= 32  -- Maximum number of GERAN cells for which system in-
                                            -- formation can be provided as redirection assistance
maxCellInfoUTRA-r9          INTEGER ::= 16  -- Maximum number of UTRA cells for which system
                                            -- information can be provided as redirection
                                            -- assistance
maxCellInter                INTEGER ::= 16  -- Maximum number of neighbouring inter-frequency
                                            -- cells listed in SIB type 5
maxCellIntra                INTEGER ::= 16  -- Maximum number of neighbouring intra-frequency
                                            -- cells listed in SIB type 4
maxCellMeas                 INTEGER ::= 32  -- Maximum number of entries in each of the neighbour
                                            -- cell lists in a measurement object
maxCellReport               INTEGER ::= 8   -- Maximum number of reported cells
maxDRB                      INTEGER ::= 11  -- Maximum number of Data Radio Bearers
maxEARFCN                   INTEGER ::= 65535   -- Maximum value of EUTRA carrier fequency
maxFreq                     INTEGER ::= 8   -- Maximum number of EUTRA carrier frequencies
maxGERAN-SI                 INTEGER ::= 10  -- Maximum number of GERAN SI blocks that can be
                                            -- provided as part of NACC information
maxGNFG                     INTEGER ::= 16  -- Maximum number of GERAN neighbour freq groups
maxMBSFN-Allocations        INTEGER ::= 8   -- Maximum number of MBSFN frame allocations with
                                            -- different offset
maxMBSFN-Area               INTEGER ::= 8
maxMeasId                   INTEGER ::= 32
maxObjectId                 INTEGER ::= 32
maxPageRec                  INTEGER ::= 16  --
maxPhysCellIdRange-r9       INTEGER ::= 4   -- Maximum number of physical cell identity ranges
maxPNOffset                 INTEGER ::= 511 -- Maximum number of CDMA2000 PNOffsets
maxPMCH-PerMBSFN            INTEGER ::= 15
maxRAT-Capabilities         INTEGER ::= 8   -- Maximum number of interworking RATs (incl EUTRA)
maxReportConfigId           INTEGER ::= 32
maxSCell-r10                INTEGER ::= 4   -- Maximum number of SCells
maxServCell-r10             INTEGER ::= 5   -- Maximum number of Serving cells
maxSessionPerPMCH           INTEGER ::= 29
maxSessionPerPMCH-1         INTEGER ::= 28
maxSIB                      INTEGER ::= 32  -- Maximum number of SIBs
maxSIB-1                    INTEGER ::= 31
maxSI-Message               INTEGER ::= 32  -- Maximum number of SI messages
maxUTRA-FDD-Carrier         INTEGER ::= 16  -- Maximum number of UTRA FDD carrier frequencies
maxUTRA-TDD-Carrier         INTEGER ::= 16  -- Maximum number of UTRA TDD carrier frequencies

-- ASN1STOP
```

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NOTE: The value of maxDRB align with SA2.

– End of EUTRA-RRC-Definitions

```
-- ASN1START

END

-- ASN1STOP
```

7.1 UE variables

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– *VarShortMAC-Input*

The UE variable *VarShortMAC-Input* specifies the input used to generate the shortMAC-I.

VarShortMAC-Input UE variable

```
-- ASN1START

VarShortMAC-Input ::=                   SEQUENCE {
    cellIdentity                            CellIdentity,
    physCellId                              PhysCellId,
    c-RNTI                                  C-RNTI
}
-- ASN1STOP
```

VarShortMAC-Input field descriptions
cellIdentity Set to CellIdentity of the current cell.
physCellId Set to the physical cell identity of the PCell the UE was connected to prior to the failure.
c-RNTI Set to C-RNTI that the UE had in the PCell it was connected to prior to the failure.

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9.2.2 Default MAC main configuration

Parameters

Name	Value	Semantics description	Ver
MAC main configuration			
maxHARQ-tx	n5		
periodicBSR-Timer	infinity		
retxBSR-Timer	sf2560		
ttiBundling	FALSE		
drx-Config	release		
phr-Config	release		
sr-ProhibitTimer	0		
extendedBSR-Sizes-r10	FALSE		r10
extendedPHR-r10	FALSE		r10

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10.2 Inter-node RRC messages

10.2.1 General

This section specifies RRC messages that are sent either across the X2- or the S1-interface, either to or from the eNB, i.e. a single 'logical channel' is used for all RRC messages transferred across network nodes. The information could originate from or be destined for another RAT.

– *EUTRA-InterNodeDefinitions*

This ASN.1 segment is the start of the E-UTRA inter-node PDU definitions.

```
-- ASN1START

EUTRA-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    AntennaInfoCommon,
    CellIdentity,
    C-RNTI,
    DL-DCCH-Message,
    ARFCN-ValueEUTRA,
    MasterInformationBlock,
    MeasConfig,
    OtherConfig-r9,
    PhysCellId,
    RadioResourceConfigDedicated,
    SCellToAddModList-r10,
    SecurityAlgorithmConfig,
    ShortMAC-I,
    SystemInformationBlockType1,
    SystemInformationBlockType1-v890-IEs,
    SystemInformationBlockType2,
    UECapabilityInformation,
    UE-CapabilityRAT-ContainerList
FROM EUTRA-RRC-Definitions;

-- ASN1STOP
```

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10.3 Inter-node RRC information element definitions

– *AS-Config*

The *AS-Config* IE contains information about RRC configuration information in the source cell which can be utilized by target cell to determine the need to change the RRC configuration during the handover preparation phase. The information can also be used after the handover is successfully performed or during the RRC connection re-establishment.

***AS-Config* information element**

```
-- ASN1START

AS-Config ::=               SEQUENCE {
    sourceMeasConfig                    MeasConfig,
    sourceRadioResourceConfig           RadioResourceConfigDedicated,
    sourceSecurityAlgorithmConfig       SecurityAlgorithmConfig,
    sourceUE-Identity                   C-RNTI,
    sourceMasterInformationBlock        MasterInformationBlock,
    sourceSystemInformationBlockType1   SystemInformationBlockType1(WITH COMPONENTS
                                            {..., nonCriticalExtension ABSENT}),
    sourceSystemInformationBlockType2   SystemInformationBlockType2,
    antennaInfoCommon                   AntennaInfoCommon,
    sourceDl-CarrierFreq                ARFCN-ValueEUTRA,
    ...,
    [[  sourceSystemInformationBlockType1Ext    OCTET STRING (CONTAINING
```

```
                                                SystemInformationBlockType1-v890-IEs)   OPTIONAL,
        sourceOtherConfig-r9                OtherConfig-r9
    ]],
    [[  sourceSCellConfigList-r10           SCellToAddModList-r10           OPTIONAL
    ]]
}

-- ASN1STOP
```

NOTE: The *AS-Config* re-uses information elements primarily created to cover the radio interface signalling requirements. Consequently, the information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the *MasterInformationBlock*.

***AS-Config* field descriptions**
sourceMeasConfig
Measurement configuration in the source cell. The measurement configuration for all measurements existing in the source cell when handover is triggered shall be included. See 10.5.
sourceRadioResourceConfig
Radio configuration in the source cell. The radio resource configuration for all radio bearers existing in the source cell when handover is triggered shall be included. See 10.5.
sourceSecurityAlgorithmConfig
This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source cell.
sourceMasterInformationBlock
MasterInformationBlock transmitted in the source cell.
sourceSystemInformationBlockType1
SystemInformationBlockType1 transmitted in the source cell.
sourceSystemInformationBlockType2
SystemInformationBlockType2 transmitted in the source cell.
antennaInfoCommon
This field provides information about the number of antenna ports in the source cell.
sourceDL-CarrierFreq
Provides the parameter Downlink EARFCN in the source cell, see TS 36.101 [42].
sourceOtherConfig
Provides other configuration in the source cell.
sourceSCellConfigList
Radio resource configuration (common and dedicated) of the SCells configured in the source cell.

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– *RRM-Config*

The *RRM-Config* IE contains information about UE specific RRM information before the handover which can be utilized by target eNB.

Deleted: after the handover is successfully performed

***RRM-Config* information element**

```
-- ASN1START

RRM-Config ::=              SEQUENCE {
    ue-InactiveTime             ENUMERATED {
                                    s1, s2, s3, s5, s7, s10, s15, s20,
                                    s25, s30, s40, s50, min1, min1s20c, min1s40,
                                    min2, min2s30, min3, min3s30, min4, min5, min6,
                                    min7, min8, min9, min10, min12, min14, min17, min20,
                                    min24, min28, min33, min38, min44, min50, hr1,
                                    hr1min30, hr2, hr2min30, hr3, hr3min30, hr4, hr5, hr6,
                                    hr8, hr10, hr13, hr16, hr20, day1, day1hr12, day2,
                                    day2hr12, day3, day4, day5, day7, day10, day14, day19,
                                    day24, day30, dayMoreThan30}        OPTIONAL,
    ...,
    candidateCellInfoList-r10   CandidateCellInfoList-r10       OPTIONAL    -- Need/ cond FFS
```

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```
}

CandidateCellInfoList-r10 ::=   SEQUENCE (SIZE (1..maxFreq)) OF CandidateCellInfo-r10

CandidateCellInfo-r10 ::=       SEQUENCE {
    -- cellIdentification
    physCellId-r10                  PhysCellId,
    dl-CarrierFreq-r10              ARFCN-ValueEUTRA,
    -- available measurement results
    rsrpResult-r10                  RSRP-Range          OPTIONAL,
    rsrqResult-r10                  RSRQ-Range          OPTIONAL,
    ...
}

-- ASN1STOP
```

***RRM-Config* field descriptions**
candidateCellInfoList
A list of cells, in order of decreasing RSRP, including the best cell on each frequency for which measurement information was available.
ue-InactiveTime
Duration while UE has not received or transmitted any user data. Thus the timer is still running in case e.g., UE measures the neighbour cells for the HO purpose. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on. Value min1 corresponds to 1 minute, value min1s20 corresponds to 1 minute and 20 seconds, value min1s40 corresponds to 1 minute and 40 seconds and so on. Value hr1 corresponds to 1 hour, hr1min30 corresponds to 1 hour and 30 minutes and so on.

10.5 Mandatory information in *AS-Config*

The *AS-Config* transferred between source eNB and target-eNB shall include all IEs necessary to describe the AS context. The conditional presence in section 6 is only applicable for eNB to UE communication.

The "need" or "cond" statements are not applied in case of sending the IEs from source eNB to target eNB. Some information elements shall be included regardless of the "need" or "cond" e.g. *discardTimer*. The *AS-Config* re-uses information elements primarily created to cover the radio interface signalling requirements. The information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the *MasterInformationBlock*.

Within the *sourceRadioResourceConfig* the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explictly specified otherwise in the following:

- in accordance with a condition that is explictly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

Name	Presence in clause 6	Comment
RadioResourceConfigDedicated		
> srb-ToAddModList	OPTIONAL, -Cond HO-Conn	-
>> rlc-Config	OPTIONAL, -Cond Setup	-
>> logicalChannelConfig	OPTIONAL, -Cond Setup	-
>>> ul-SpecificParameters	OPTIONAL, -Cond UL	- The conditional presence applies
>>>> logicalChannelGroup	OPTIONAL, -Need OR	-
>>> logicalChannelSR-Mask-r9	OPTIONAL, -Cond SRmask	- The conditional presence applies
>drb-ToAddModList	OPTIONAL, -Cond HO-toEUTRA	-
>> eps-BearerIdentity	OPTIONAL, -Cond DRB-Setup	-
>> pdcp-Config	OPTIONAL, -Cond PDCP	-
>>> discardTimer	OPTIONAL, -Cond Setup	-
>>> rlc-AM	OPTIONAL, -Cond Rlc-AM	- The conditional presence applies
>>> rlc-UM	OPTIONAL, -Cond Rlc-UM	- The conditional presence applies
>> rlc-Config	OPTIONAL, -Cond Setup	-
>> logicalChannelIdentity	OPTIONAL, -Cond DRB-Setup	-
>> logicalChannelConfig	OPTIONAL, -Cond Setup	-
>>> ul-SpecificParameters	OPTIONAL, -Cond UL	- The conditional presence applies
>>>> logicalChannelGroup	OPTIONAL, -Need OR	-
>>> logicalChannelSR-Mask-r9	OPTIONAL, -Cond SRmask	- The conditional presence applies
> mac-MainConfig	OPTIONAL, -Need ON	-
>> ul-SCH-Config	OPTIONAL, -Need ON	-
>>> maxHARQ-Tx	OPTIONAL, -Need ON	-
>> periodicBSR-Timer	OPTIONAL, -Need ON	-
>> drx-Config	OPTIONAL, -Need ON	-
>>> shortDRX	OPTIONAL, -Need ON	-
>> phr-Config	OPTIONAL, -Need ON	-
>> sr-ProhibitTimer	OPTIONAL, -Need ON	-
> sps-Config	OPTIONAL, -Need ON	-
>> sps-ConfigDL	OPTIONAL, -Need ON	-
>> sps-ConfigUL	OPTIONAL, -Need ON	-
>>> p0-Persistent	OPTIONAL, -Need OP	-
>>> twoIntervalsConfig	OPTIONAL, -Cond TDD	- The conditional presence applies
> physicalConfigDedicated	OPTIONAL, -Need ON	-
>> pdsch-ConfigDedicated	OPTIONAL, -Need ON	-
>> pucch-ConfigDedicated	OPTIONAL, -Need ON	-
>>> tdd-AckNackFeedbackMode	OPTIONAL, -Cond TDD	- The conditional presence applies
>> pusch-ConfigDedicated	OPTIONAL, -Need ON	-
>> uplinkPowerControlDedicated	OPTIONAL, -Need ON	-
>> tpc-PDCCH-ConfigPUCCH	OPTIONAL, -Need ON	-
>> tpc-PDCCH-ConfigPUSCH	OPTIONAL, -Need ON	-
>> cqi-ReportConfig	OPTIONAL, -Need ON	-
>>> cqi-ReportingModeAperiodic	OPTIONAL, -Need OR	-
>>> cqi-ReportPeriodic	OPTIONAL, -Need ON	-
>> soundingRS-UL-ConfigDedicated	OPTIONAL, -Need ON	-
>> antennaInfo	OPTIONAL, -Need ON	-
>>> codebookSubsetRestriction	OPTIONAL, -Cond TM	- The conditional presence applies
>> schedulingRequestConfig	OPTIONAL, -Need ON	-
>physicalConfigDedicated-v920	OPTIONAL, -Need ON	-
>> cqi-ReportConfig-v920	OPTIONAL, -Need OR	-
>>> cqi-Mask-r9	OPTIONAL, -Cond cqi-reportPeriod	- The conditional presence applies
>>> pmi-RI-Report-r9	OPTIONAL, -Cond PMIRI	- The conditional presence applies
>> antennaInfo-v920	OPTIONAL, -Need ON	-
>>> codebookSubsetRestriction-v920	OPTIONAL, -Cond TM8	- The conditional presence applies
> rlf-TimersAndConstants-r9	OPTIONAL, -Need ON	-

For the measurement configuration, a corresponding operation as 5.5.6.1 and 5.5.2.2a is executed by target eNB.

Within the *sourceMeasConfig* the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explictly specified otherwise in the following:

- in accordance with a condition that is explictly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or

- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

Name	Presence in clause 6	Comment
MeasConfig		
> measObjectToAddModList	OPTIONAL, -Need ON	-
>> measObject	-	-
>>> measObjectEUTRA	-	-
>>>> cellsToAddModList	OPTIONAL, -Need ON	-
>>>> blackCellsToAddModList	OPTIONAL, -Need ON	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
>>> MeasObjectUTRA	-	-
>>>> cellsToAddModList	OPTIONAL, -Need ON	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
>>>> csg-allowedReportingCells-v930	OPTIONAL, -Need ON	-
>>> MeasObjectGERAN	-	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	-
>>> MeasObjectCDMA2000	-	-
>>>> searchWindowSize	OPTIONAL, -Need ON	-
>>>> cellsToAddModList	OPTIONAL, -Need ON	-
>>>> cellForWhichToReportCGI	OPTIONAL, -Need ON	
> reportConfigToAddModList	OPTIONAL, -Need ON	-
> measIdToAddModList	OPTIONAL, -Need ON	-
> quantityConfig	OPTIONAL, -Need ON	-
>> quantityConfigEUTRA	OPTIONAL, -Need ON	-
>> quantityConfigUTRA	OPTIONAL, -Need ON	-
>> quantityConfigGERAN	OPTIONAL, -Need ON	-
>> quantityConfigCDMA2000	OPTIONAL, -Need ON	-
> s-Measure	OPTIONAL, -Need ON	-
> preRegistrationInfoHRPD	OPTIONAL, -Need OP	
>> preRegistrationZoneId	OPTIONAL, -Cond PreRegAllowed	- The conditional presence applies
>> secondaryPreRegistrationZoneIdList	OPTIONAL, -Need OR	-
> speedStatePars	OPTIONAL, -Need ON	-

Within the *sourceOtherConfig* the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explictly specified otherwise in the following:

- in accordance with a condition that is explictly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

Name	Presence in clause 6	Comment
OtherConfig		
> reportProximityConfig-r9	OPTIONAL, -Need ON	-