**3GPP TSG-RAN2 Meeting #109bis-e *Draft\_*** ***R2-2004040***

**Online, 20th - 30th April 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.331** | **CR** | **4287** | **rev** | **1** | **Current version:** | **16.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Miscellaneous corrections to 36.331 for Rel-16 NB-IoT | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh3-Core, LTE\_eMTC5-Core | | | | |  | ***Date:*** | | | 2020-05-05 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change 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](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | |  | | | | | | | | |
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| ***Summary of change:*** | | 1. Address the RIL issues concluded in NB-IoT ASN.1 review session (marked as [RIL] number):   [H081], [H086], [H084], [H089], [H091], [H095], [H096], [H098], [H106],  [H107], [H108], [H109], [H110], [H116], [H118], [H122], [H125], [H127],  [H130], [H133], [H134], [H136b], [H141], [H143], [H144], [H146], [H148],  [H150], [H228], [H229]  [N001]  [Z607]   1. Address the RIL issues concluded in eMTC ASN.1 review session (marked as [RIL] number):   [N009]   1. Address the RIL issues concluded in LTE general ASN.1 review session (marked as [RIL] number):   [N016], [H099], [H114], [H129], [H131], [H136], [H140]  Use of parameterized type “SetupRelease” (marked as RAN2#109bis-e)   1. RAN2 agreements on GWUS (marked as RAN2#109bis-e): 2. The following codepoints are used to indicate a paging probability threshold value: {p20,p30,p40,p50,p60,p70,p80,p90} 3. Confirm the working assumption: Maximum number probability thresholds is 3 giving a total of 4 groups. 4. Confirm the working assumption: “Support of Release 16 WUS is independent to support of Release 15 WUS”. 5. RAN2 agreements on PUR (marked as RAN2#109bis-e): 6. For both NB-IoT and eMTC, the value range of pur-TimeAlignmentTimer-r16 is INTEGER (1..8), i.e. 1~8 \* PUR periodicity. 7. PUR release due to RACH initiation on a new cell is captured in RRC. 8. PUR configuration is released when the UE initiates RA procedure on a new cell for all purposes. 9. Revert the previous working assumption, PUR grant is maintained in RRC. 10. The handling of ‘m’ counter is moved from MAC to RRC 11. For pur-Periodicity-r16 and requestedPeriodicity-r16, confirm that the value range is {hsf8, hsf16, hsf32, hsf64, hsf128, hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192, spare5, spare4, spare3, spare2, spare1} for both NB-IoT and eMTC 12. RAN2 agreements on SON/ANR (marked as RAN2#109bis-e): 13. Confirm the Working assumption that the ANR report is discarded after 96 hours. 14. ANR measurement report is discarded upon RAT change. 15. Re-establishment Cell ID is included in the RLF report, only if different to the cell on which the report is sent. 16. RLF report is discarded in the following cases:  * Reporting rlf-InfoAvailable and returning to idle. * RAT change * Power off or detach. * (already agreed) after 48 hours if not fetched  1. RAN2 agreements on UE specific DRX (marked as RAN2#109bis-e): 2. Introduce an indication in SIB to enable/disable the use of UE specific DRX cycles in NB-IoT for 5GS (similar to EPS). 3. The SIB indication to enable/disable the use of UE specific DRX for 5GS is cell specific indication. 4. RAN2 agreements on UE capabilities (marked as RAN2#109bis-e) 5. Miscellaneous corrections | | | | | | | | |
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| ***Consequences if not approved:*** | | The specification is ambiguous. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.1, 5.3.3.1c, 5.3.3.2, 5.3.3.3a, 5.3.3.3b, 5.3.3.x (new), 5.3.7.2, 5.3.7.4, 5.3.8.3, 5.3.11.3, 5.6.0, 5.6.5.3, 5.6.23.3, 5.6.24.0, 5.6.24.1, 6.4, 6.7.2, 6.7.3.1, 6.7.3.2, 6.7.4, 7.1a | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **N** | Other core specifications | | | | TS xxxx CRxxxx | | |
| ***affected:*** | |  | **N** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **N** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| Start of change |

### 4.2.1 UE states and state transitions including inter RAT

A UE is in RRC\_CONNECTED when an RRC connection has been established or in RRC\_INACTIVE (if the UE is connected to 5GC) when RRC connection is suspended. 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 (by CN paging), 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.

- Performs logging of available measurements together with location and time for logged measurement configured UEs.

- May perform EDT.

- May perform transmission using PUR.

**- RRC\_INACTIVE**:

- A UE specific DRX may be configured by upper layers or by RRC layer;

- A RAN-based notification area is configured by RRC layer;

- The UE stores the UE Inactive AS context;

- The UE:

- Applies RRC\_IDLE procedures unless specified otherwise;

- Monitors a Paging channel for CN paging using 5G-S-TMSI and RAN paging using fullI-RNTI;

- Performs periodic RAN-based notification area update;

- Performs RAN-based notification area update when moving out of the configured RAN-based notification area;

- **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;

- For UEs supporting DC, use of one SCG, aggregated with the MCG, for increased bandwidth;

- For UEs supporting (NG)EN-DC, option to configure one NR SCG in conjunction with the MCG for DRBs and SRBs, for improved performance (SRBs) and increased bandwidth (DRBs);

- For UEs supporting NE-DC, option to configure one SCG in conjunction with the NR MCG for DRBs and SRBs, for improved performance (SRBs) and increased bandwidth (DRBs);

- Network controlled mobility, i.e. handover and cell change order with optional network assistance (NACC) to GERAN (not applicable for NB-IoT);

- 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 (not applicable for BL UEs, UEs in CE and NB-IoT UEs);

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

- For UEs in CE supporting reception of ETWS/CMAS indication in RRC\_CONNECTED mode, monitors control channels associated with the shared data channel to acquire ETWS notification and/or CMAS notification;

- Provides channel quality and feedback information (not applicable for NB-IoT);

- Performs neighbouring cell measurements and measurement reporting (not applicable for NB-IoT);

- Acquires system information (not applicable for BL UEs, UEs in CE and NB-IoT UEs), except for ETWS/CMAS reception where applicable.

NOTE: The term "UE is connected to 5GC" covers the scenarios that the UE is connected to 5GC and the UE is requesting to connect with 5GC.

Figure 4.2.1-1 not only provides an overview of the RRC states in E-UTRA/EPC, but also illustrates the mobility support between E-UTRA/EPC, UTRAN and GERAN.



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

Figure 4.2.1-2 illustrates the mobility support between E-UTRA/EPC, 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/EPC and CDMA2000

Figure 4.2.1-3 not only provides an overview of the RRC states in E-UTRA/5GC, but also illustrates the mobility support between E-UTRA/5GC, UTRAN and GERAN.



Figure 4.2.1-3: E-UTRA/5GC states and inter RAT mobility procedures, 3GPP

Figure 4.2.1-4 illustrates the mobility procedures supported between E-UTRA/5GC, CDMA2000 1xRTT and CDMA2000 HRPD. The details of the CDMA2000 state models are out of the scope of this specification.



Figure 4.2.1-4: Mobility procedures between E-UTRA/5GC and CDMA2000

Figure 4.2.1-5 illustrates the mobility procedures supported between E-UTRA/5GC and E-UTRA/EPC.



Figure 4.2.1-5: Mobility procedures between E-UTRA/5GC and E-UTRA/EPC

Figure 4.2.1-6 illustrates the mobility procedures supported between E-UTRA/EPC, E-UTRA/5GC and NR.



Figure 4.2.1-6: Mobility procedures between E-UTRA/EPC, E-UTRA/5GC and NR

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 figures above, there is support for connection release with redirection information from E-UTRA RRC\_CONNECTED to GERAN, UTRAN, CDMA2000 (HRPD Idle/ 1xRTT Dormant mode) and NR. A UE in RRC\_INACTIVE enters RRC\_IDLE when it enters another RAT or switches to another CN type.

For NB-IoT, mobility between E-UTRA and UTRAN, GERAN and between E-UTRA and CDMA2000 1xRTT and CDMA2000 HRPD is not supported at AS level and hence only the E-UTRA states depicted in Figure 4.2.1-1 are applicable.

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| Start of change |

#### 5.3.3.1c Conditions for initiating transmission using PUR

A BL UE, UE in CE or NB-IoT can initiate transmission using PUR when all of the following conditions are fulfilled:

1> the UE has a valid PUR configuration for the serving cell as specified in 5.3.3.x;

1> the UE has a valid timing alignment value as specified in 5.3.3.19;

1> the upper layers request establishment of an RRC connection; or the upper layers request resumption of an RRC connection and the UE has a stored value of the *nextHopChainingCount* provided in the *RRCConnectionRelease* message with suspend indication during the preceding suspend procedure;

1> the establishment or resumption request is for mobile originating calls and the establishment cause is *mo-Data* or *mo-ExceptionData* or *delayTolerantAccess*;

1> for CP transmission using PUR, the size of the resulting MAC PDU including the total UL data is expected to be smaller than or equal to the TBS configured for PUR.

NOTE 1: Upper layers request or resume an RRC connection. The interaction with NAS is up to UE implementation.

NOTE 2: It is up to UE implementation how the UE determines whether the establishment or resumption request is suitable for transmission using PUR.

#### 5.3.3.x Maintenance of PUR occasions

The UE configured with *pur-Config* shall:

1> consider that the Nth PUR occasion occurs at H-SF and subframe according to *pur-StartTime* and N \* *pur-Periodicity.*

Editor’s Note: The details of the calculation of PUR occasion needs to be updated when we know more details on the start offset. The exact time (subframe/frame/hsf needs to be provided here)

1> if the *pur-NumOccasions* is set to *one*, after the occurence of the first PUR occasion:

2> release *pur-Config*;

2> discard previously stored *pur-Config*;

1> else if the *pur-ImplicitReleaseAfter* is configured, for each PUR occcasion in RRC\_IDLE:

2> if transmission using PUR in accordance with conditions in 5.3.3.1c is not initiated; or

2> if PUR failure indication is received from lower layers:

3> consider the PUR occasion as skipped;

3> if *pur-ImplicitReleaseAfter* number of consecutive PUR occasions have been skipped:

4> release *pur-Config*;

4> discard previously stored *pur-Config*;

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| Next change |

#### 5.3.3.2 Initiation

The UE initiates the procedure when upper layers request establishment or resume of an RRC connection while the UE is in RRC\_IDLE or when upper layers request resume of an RRC connection or RRC layer requests resume of an RRC connection for, e.g. RNAU or reception of RAN paging while the UE is in RRC\_INACTIVE.

Except for NB-IoT, upon initiation of the procedure, if the UE is connected to EPC, the UE shall:

1> if *SystemInformationBlockType2* includes *ac-BarringPerPLMN-List* and the *ac-BarringPerPLMN-List* contains an *AC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]):

2> select the *AC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers;

2> in the remainder of this procedure, use the selected *AC-BarringPerPLMN* entry (i.e. presence or absence of access barring parameters in this entry) irrespective of the common access barring parameters included in *SystemInformationBlockType2;*

1> else

2> in the remainder of this procedure use the common access barring parameters (i.e. presence or absence of these parameters) included in *SystemInformationBlockType2;*

1> if *SystemInformationBlockType2* contains *acdc-BarringPerPLMN-List* and the *acdc-BarringPerPLMN-List* contains an *ACDC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]):

2> select the *ACDC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers;

2> in the remainder of this procedure, use the selected *ACDC-BarringPerPLMN* entry for ACDC barring check (i.e. presence or absence of access barring parameters in this entry) irrespective ofthe *acdc-BarringForCommon* parameters included in *SystemInformationBlockType2*;

1> else:

2> in the remainder of this procedure use the *acdc-BarringForCommon* (i.e. presence or absence of these parameters) included in *SystemInformationBlockType2* for ACDC barring check;

1> if upper layers indicate that the RRC connection is subject to EAB (see TS 24.301 [35]):

2> if the result of the EAB check, as specified in 5.3.3.12, is that access to the cell is barred:

3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that EAB is applicable, upon which the procedure ends;

1> if upper layers indicate that the RRC connection is subject to ACDC (see TS 24.301 [35]), *SystemInformationBlockType2* contains *BarringPerACDC-CategoryList*, and *acdc-HPLMNonly* indicates that ACDC is applicable for the UE:

2> if the *BarringPerACDC-CategoryList* contains a *BarringPerACDC-Category* entry corresponding to the ACDC category selected by upper layers:

3> select the *BarringPerACDC-Category* entry corresponding to the ACDC category selected by upper layers;

2> else:

3> select the last *BarringPerACDC-Category* entry in the *BarringPerACDC-CategoryList*;

2> stop timer T308, if running;

2> perform access barring check as specified in 5.3.3.13, using T308 as "Tbarring" and *acdc-BarringConfig* in the *BarringPerACDC-Category* as "ACDC barring parameter";

2> if access to the cell is barred:

3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring is applicable due to ACDC, upon which the procedure ends;

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

2> if timer T302 is running:

3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile terminating calls is applicable, upon which the procedure ends;

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

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

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

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

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

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

6> consider access to the cell as barred;

4> else:

5> consider access to the cell as barred;

2> if access to the cell is barred:

3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication, upon which the procedure ends;

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

2> perform access barring check as specified in 5.3.3.11, using T303 as "Tbarring" and *ac-BarringForMO-Data* as "AC barring parameter";

2> if access to the cell is barred:

3> if *SystemInformationBlockType2* includes *ac-BarringForCSFB* or the UE does not support CS fallback:

4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls is applicable, upon which the procedure ends;

3> else (*SystemInformationBlockType2* does not include *ac-BarringForCSFB* and the UE supports CS fallback):

4> if timer T306 is not running, start T306 with the timer value of T303;

4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls and mobile originating CS fallback is applicable, upon which the procedure ends;

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

2> perform access barring check as specified in 5.3.3.11, using T305 as "Tbarring" and *ac-BarringForMO-Signalling* as "AC barring parameter";

2> if access to the cell is barred:

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

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

2> if *SystemInformationBlockType2* includes *ac-BarringForCSFB*:

3> perform access barring check as specified in 5.3.3.11, using T306 as "Tbarring" and *ac-BarringForCSFB* as "AC barring parameter";

3> if access to the cell is barred:

4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating CS fallback is applicable, due to *ac-BarringForCSFB*, upon which the procedure ends;

2> else:

3> perform access barring check as specified in 5.3.3.11, using T306 as "Tbarring" and *ac-BarringForMO-Data* as "AC barring parameter";

3> if access to the cell is barred:

4> if timer T303 is not running, start T303 with the timer value of T306;

4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating CS fallback and mobile originating calls is applicable, due to *ac-BarringForMO-Data*, upon which the procedure ends;

1> else if the UE is establishing the RRC connection for mobile originating MMTEL voice, mobile originating MMTEL video, mobile originating SMSoIP or mobile originating SMS; or

1> if the UE is establishing the RRC connection after EPS fallback for IMS voice (see TS 23.502 [102]) was triggered in NR via *RRCRelease* with *voiceFallbackIndication* (see TS 38.331 [82]):

2> if the UE is establishing the RRC connection for mobile originating MMTEL voice and *SystemInformationBlockType2* includes *ac-BarringSkipForMMTELVoice*; or

2> if the UE is establishing the RRC connection for mobile originating MMTEL video and *SystemInformationBlockType2* includes *ac-BarringSkipForMMTELVideo*; or

2> if the UE is establishing the RRC connection for mobile originating SMSoIP or SMS and *SystemInformationBlockType2* includes *ac-BarringSkipForSMS*:

3> consider access to the cell as not barred;

2> else:

3> if *establishmentCause* received from higher layers is set to *mo-Signalling* (including the case that *mo-Signalling* is replaced by *highPriorityAccess* according to TS 24.301 [35] or by *mo-VoiceCall* according to the clause 5.3.3.3)*:*

4> perform access barring check as specified in 5.3.3.11, using T305 as "Tbarring" and *ac-BarringForMO-Signalling* as "AC barring parameter";

4> if access to the cell is barred:

5> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating signalling is applicable, upon which the procedure ends;

3> if *establishmentCause* received from higher layers is set to *mo-Data* (including the case that *mo-Data* is replaced by *highPriorityAccess* according to TS 24.301 [35] or by *mo-VoiceCall* according to the clause 5.3.3.3):

4> perform access barring check as specified in 5.3.3.11, using T303 as "Tbarring" and *ac-BarringForMO-Data* as "AC barring parameter";

4> if access to the cell is barred:

5> if *SystemInformationBlockType2* includes *ac-BarringForCSFB* or the UE does not support CS fallback:

6> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls is applicable, upon which the procedure ends;

5> else (*SystemInformationBlockType2* does not include *ac-BarringForCSFB* and the UE supports CS fallback):

6> if timer T306 is not running, start T306 with the timer value of T303;

6> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls and mobile originating CS fallback is applicable, upon which the procedure ends;

Upon initiation of the procedure, if the UE is connected to 5GC, the UE shall:

1> if the upper layers provide an Access Category and one or more Access Identities upon requesting establishment of an RRC connection:

2> perform the unified access control procedure as specified in 5.3.16 using the Access Category and Access Identities provided by upper layers;

3> if the access attempt is barred, the procedure ends;

1> if the resumption of the RRC connection is triggered by response to NG-RAN paging:

2> select '0' as the Access Category;

2> perform the unified access control procedure as specified in 5.3.16 using the selected Access Category and one or more Access Identities provided by upper layers;

3> if the access attempt is barred, the procedure ends;

1> else if the resumption of the RRC connection is triggered by upper layers:

2> if the upper layers provide an Access Category and one or more Access Identities:

3> perform the unified access control procedure as specified in 5.3.16 using the Access Category and Access Identities provided by upper layers;

4> if the access attempt is barred, the procedure ends;

2> set the *resumeCause* in accordance with the information received from upper layers;

1> else if the resumption of the RRC connection is triggered due to an RNAU:

2> if an emergency service is ongoing:

3> select '2' as the Access Category;

3> set the *resumeCause* to *emergency*;

2> else:

3> select '8' as the Access Category;

2> perform the unified access control procedure as specified in 5.3.16 using the selected Access Category and one or more Access Identities to be applied as specified in TS 24.501 [95];

3> if the access attempt is barred:

4> set the variable *pendingRnaUpdate* to 'TRUE';

4> the procedure ends;

Except for NB-IoT, upon initiating the procedure, if connected to EPC or 5GC, the UE shall:

1> if the UE is resuming an RRC connection from a suspended RRC connection or from RRC\_INACTIVE:

2> if the UE was configured with (NG)EN-DC:

3> if the UE does not support maintaining SCG configuration upon connection resumption:

4> perform MR-DC release, as specified in TS 38.331 [82], clause 5.3.5.10;

3> release *p-MaxEUTRA*, if configured;

3> release *p-MaxUE-FR1*, if configured;

3> release *tdm-PatternConfig*, if configured;

2> if the UE does not support maintaining the MCG SCell configurations upon connection resumption:

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

2> release *powerPrefIndicationConfig*, if configured and stop timer T340, if running;

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

2> release *obtainLocationConfig*, if configured;

2> release *idc-Config*, if configured;

2> release *sps-AssistanceInfoReport*, if configured;

2> release *measSubframePatternPCell*, if configured;

2> if the UE was configured with DC:

3> release the entire SCG configuration, if configured, except for the DRB configuration (as configured by *drb-ToAddModListSCG*);

2> release *naics-Info* for the PCell, if configured;

2> release the LWA configuration, if configured, as described in 5.6.14.3;

2> release the LWIP configuration, if configured, as described in 5.6.17.3;

2> release *bw-PreferenceIndicationTimer*, if configured and stop timer T341, if running;

2> release *delayBudgetReportingConfig*, if configured and stop timer T342, if running;

2> release *ailc-BitConfig*, if configured;

2> release *uplinkDataCompression*, if configured;

NOTE 1a: The parameters and configurations are released from the UE Inactive AS context if the UE is resuming an RRC connection from RRC\_INACTIVE.

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> apply the CCCH configuration as specified in 9.1.1.2;

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

1> start timer T300;

1> if the UE is resuming an RRC connection from a suspended RRC connection:

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

1> else if the UE is resuming an RRC connection from RRC\_INACTIVE:

2> set the variable *pendingRnaUpdate* to 'FALSE';

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

1> else:

2> if stored, discard the UE AS context, UE Inactive AS context and *resumeIdentity*;

2> release *rrc-InactiveConfig*, if configured;

2> if the UE is initiating CP-EDT in accordance with conditions in 5.3.3.1b; or

2> if the UE is initiating CP transmission using PUR in accordance with conditions in 5.3.3.1c:

3> initiate transmission of the *RRCEarlyDataRequest* message in accordance with 5.3.3.3b;

2> else:

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

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

For NB-IoT, upon initiation of the procedure, the UE shall:

1> if theUEis connected to EPC:

2> if theUEis establishing or resuming the RRC connection for mobile originating exception data;or

2> if theUEis establishing or resuming the RRC connection for mobile originating data;or

2> if theUEis establishing or resuming the RRC connection for delay tolerant access;or

2> if theUEis establishing or resuming the RRC connection for mobile originating signalling;

3> perform access barring check as specified in 5.3.3.14;

3> if access to the cell is barred:

4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring is applicable, upon which the procedure ends;

1> if the UE is connected to 5GC:

2> if the Access Category provided by the upper layers is different from '0':

3> perform access barring check for per-NRSRP barring as specified in 5.3.3.14;

3> if access to the cell is barred:

4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication, upon which the procedure ends;

3> else:

4> perform the unified access control procedure as specified in 5.3.16 using the Access Category and Access Identities provided by upper layers;

4> if the access attempt is barred, the procedure ends;

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

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

1> apply the CCCH configuration as specified in 9.1.1.2;

1> start timer T300;

1> if the UE has a stored *pur-Config* and the UE is establishing or resuming an RRC connection in a cell different from the cell where *pur-Config* was provided:

2> release *pur-Config*;

2> discard previously stored *pur-Config*;

1> if the UE is establishing an RRC connection:

2> if stored, discard the UE AS context and *resumeIdentity*;

2> if the UE is initiating CP-EDT in accordance with conditions in 5.3.3.1b; or

2> if the UE is initiating CP transmission using PUR in accordance with conditions in 5.3.3.1c:

3> initiate transmission of the *RRCEarlyDataRequest* message in accordance with 5.3.3.3b;

2> else:

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

1> else if the UE is resuming an RRC connection:

2> release *schedulingRequestConfig*, if configured;

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

NOTE 3: Upon initiating the connection establishment or resumption procedure, the UE is not required to ensure it maintains up to date system information applicable only for UEs in RRC\_IDLE state. However, the UE needs to perform system information acquisition upon cell re-selection.

NOTE 4: For EDT and transmission using PUR, upon initiating the connection establishment or resumption procedure, it is up to UE implementation whether to continue cell re-selection related measurements as well as cell re-selection evaluation and, if the conditions for cell re-selection are fulfilled, whether to perform cell re-selection as specified in 5.3.3.5.

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| Next change |

#### 5.3.3.3a Actions related to transmission of *RRCConnectionResumeRequest* message

If the UE is resuming the RRC connection from a suspended RRC connection, the UE shall set the contents of *RRCConnectionResumeRequest* message as follows:

1> if the UE is a NB-IoT UE; or

1> if the UE is initiating UP-EDT for mobile originating calls in accordance with conditions in 5.3.3.1b; or

1> if the UE is initiating UP transmission using PUR in accordance with conditions in 5.3.3.1c; or

1> if field *useFullResumeID* is signalled in *SystemInformationBlockType2*:

2> set the *resumeID* to the stored *resumeIdentity*;

1> else:

2> set the *truncatedResumeID* to include bits in bit position 9 to 20 and 29 to 40 from the left in the stored *resumeIdentity*.

1> if the UE supports *mo-VoiceCall* establishment cause and UE is resuming the RRC connection for mobile originating MMTEL voice and *SystemInformationBlockType2* includes *voiceServiceCauseIndication* and the establishment cause received from upper layers is not set to *highPriorityAccess*:

2> set the *resumeCause* to *mo-VoiceCall*;

1> else if the UE supports *mo-VoiceCall* establishment cause for mobile originating MMTEL video and UE is resuming the RRC connection for mobile originating MMTEL video and *SystemInformationBlockType2* includes *videoServiceCauseIndication* and the establishment cause received from upper layers is not set to *highPriorityAccess*:

2> set the *resumeCause* to *mo-VoiceCall*;

1> else if the UE is initiating UP-EDT for mobile terminating calls in accordance with conditions in 5.3.3.1b:

2> set the *resumeCause* to *mt-EDT*;

1> else:

2> set the *resumeCause* in accordance with the information received from upper layers;

1> set the *shortResumeMAC-I* to the 16 least significant bits of the MAC-I calculated:

2> over the ASN.1 encoded as per clause 8 (i.e., a multiple of 8 bits) *VarShortResumeMAC-Input* (or *VarShortResumeMAC-Input-NB* in NB-IoT);

2> with the KRRCint key and the previously configured integrity protection algorithm; and

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

1> if the UE is a NB-IoT UE:

2> if the UE supports DL channel quality reporting in MSG3 and *cqi-Reporting* is present in *SystemInformationBlockType2-NB*:

3> set the *cqi-NPDCCH* to include the latest results of the downlink channel quality measurements of the carrier where the random access response is received as specified in TS 36.133 [16];

NOTE 0: The downlink channel quality measurements use measurement period T1 or T2, as defined in TS 36.133 [16].

2> if the UE is connected to EPC, set *earlyContentionResolution* to TRUE;

1> restore the RRC configuration and security context from the stored UE AS context, except for the following:

- MCG SCell(s), if stored,

- *nr-SecondaryCellGroupConfig*, if stored;

1> if the UE is initiating UP-EDT for mobile originating calls in accordance with conditions in 5.3.3.1b:

2> if the UE is a NB-IoT UE connected to EPC:

3> if the UE has ANR measurements information available in *VarANR-MeasReport-NB* and if the RPLMN is included in *plmn-IdentityList* stored in *VarANR-MeasReport-NB*:

4> set *anr-InfoAvailable* to TRUE;

1> if the UE is resuming an RRC connection after early security reactivation in accordance with conditions in 5.3.3.18:

2> if the UE is initiating UP-EDT in accordance with conditions in 5.3.3.1b; or

2> if the UE is initiating UP transmission using PUR in accordance with conditions in 5.3.3.1c:

3> restore the PDCP state and re-establish PDCP entities for all SRBs and all DRBs;

3> if *drb-ContinueROHC* has been provided in immediately preceding RRC connection release message, and the UE is requesting to resume RRC connection in the same cell:

4> indicate to lower layers that stored UE AS context is used and that *drb-ContinueROHC* is configured;

4> continue the header compression protocol context for the DRBs configured with the header compression protocol;

3> else:

4> indicate to lower layers that stored UE AS context is used;

4> reset the header compression protocol context for the DRBs configured with the header compression protocol;

3> resume all SRBs and all DRBs;

2> else:

3> if the UE is a BL UE or UE in CE, restore the PDCP state and re-establish the PDCP entity for SRB1;

3> if the UE is a NB-IoT UE, apply the default configuration for SRB1 as specified in 9.2.1.1;

3> resume SRB1;

2> derive the KeNB key based on the KASME key to which the current KeNB is associated, using the stored value of *nextHopChainingCount* received in the *RRCConnectionRelease* message in the preceding connection, as specified in TS 33.401 [32] for EPC and TS 33.501 [86] for 5GC;

2> derive the KRRCint key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32] for EPC and TS 33.501 [86] for 5GC;

2> derive the KRRCenc key and the KUPenc key associated with the previously configured ciphering algorithm, as specified in TS 33.401 [32] for EPC and TS 33.501 [86] for 5GC;

2> configure lower layers to resume integrity protection using the previously configured algorithm and the KRRCint key derived in this clause to all subsequent messages received and sent by the UE;

2> configure lower layers to resume ciphering and to apply the ciphering algorithm and the KRRCenc key derived in this clause to all subsequent messages received and sent by the UE;

2> configure lower layers to resume ciphering and to apply the ciphering algorithm and the KUPenc key derived in this clause immediately to the user data sent and received by the UE;

2> if the UE is initiating UP-EDT for mobile originated calls in accordance with conditions in 5.3.3.1b:

3> configure the lower layers to use EDT;

2> else if the UE is initiating UP transmission using PUR in accordance with conditions in 5.3.3.1c:

3> configure the lower layers to use PUR;

1> else:

2> if SRB1 was configured with NR PDCP:

3> for SRB1, release the NR PDCP entity and establish an E-UTRA PDCP entity with the current (MCG) security configuration;

NOTE 1: The UE applies the LTE ciphering and integrity protection algorithms that are equivalent to the previously configured NR security algorithms.

2> else:

3> for SRB1, restore the PDCP state and re-establish the PDCP entity;

If the UE is resuming the RRC connection from RRC\_INACTIVE, the UE shall set the contents of *RRCConnectionResumeRequest* message as follows:

2> if field *useFullResumeID* is signalled in *SystemInformationBlockType2*:

3> set the *fullI-RNTI* to the stored *fullI-RNTI* value provided in suspend;

2> else:

3> set the *shortI-RNTI* to the stored *shortI-RNTI* value provided in suspend;

2> restore the RRC configuration, RoHC state, the stored QoS flow to DRB mapping rules and the KeNB and KRRCint keys from the UE Inactive AS context except for the following:

- MCG physical layer,

- MCG MAC configuration,

- NR *pdcp-Config*,

- MCG SCell configurations, if stored,

- *nr*-*SecondaryCellGroupConfig*, if stored;

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

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

3> with the KRRCint key in the UE Inactive AS Context and the previously configured integrity protection algorithm; and

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

2> derive the KeNB key based on the current KeNB or the NH, using the stored *nextHopChainingCount* value, as specified in TS 33.501 [86];

2> derive the KRRCenc key, the KRRCint and the KUPenc key, as specified in TS 33.401 [32];

2> apply the default configuration for SRB1 as specified in 9.2.1.1;

2> apply the default NR PDCP configuration as specified in TS 38.331 [82], clause 9.2.1 for SRB1;

2> configure lower layers to resume integrity protection for all SRBs except SRB0 using the configured algorithm and the KRRCint key derived in this clause immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE;

2> configure lower layers to resume ciphering for all radio bearers except SRB0 and to apply the configured ciphering algorithm, the KRRCenc key and the KUPenc key derived in this clause, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE;

Following procedures are applied for both suspended RRC connection and RRC\_INACTIVE:

2> resume SRB1;

NOTE 2: Until successful connection resumption, the default physical layer configuration and the default MAC Main configuration are applied for the transmission of SRB0 and SRB1, and SRB1 is used only for the transfer of *RRCConnectionResume* message, and *RRCConnectionRelease* message if security has been re-activated.

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

The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation.

If the UE is resuming the RRC connection from RRC\_INACTIVE and if lower layers indicate an integrity check failure while T300 is running, the UE shall perform actions specified in 5.3.3.16.

#### 5.3.3.3b Actions related to transmission of *RRCEarlyDataRequest* message

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

1> if upper layers provide an S-TMSI:

2> set the *s-TMSI* to the value received from upper layers;

1> else if upper layers provide a 5G-S-TMSI:

2> set the *ng-5G-S-TMSI* to the value received from upper layers;

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

1> if the UE is a NB-IoT UE:

2> if the UE supports DL channel quality reporting and *cqi-Reporting* is present in *SystemInformationBlockType2-NB*:

3> set the *cqi-NPDCCH* to include the latest results of the downlink channel quality measurements of the carrier where the random access response is received as specified in TS 36.133 [16];

NOTE: The downlink channel quality measurements may use measurement period T1 or T2, as defined in TS 36.133 [16]. In case period T2 is used the RRC-MAC interactions are left to UE implementation.

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

The UE shall:

1> if the UE is initiating CP-EDT in accordance with conditions in 5.3.3.1b:

2> configure the lower layers to use EDT;

1> else if the UE is initiating CP transmission using PUR in accordance with conditions in 5.3.3.1c:

2> configure the lower layers to use PUR;

1> submit the *RRCEarlyDataRequest* message to the lower layers for transmission.

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| Next change |

#### 5.3.3.4 Reception of the *RRCConnectionSetup* by the UE

NOTE 1: 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> if the *RRCConnectionSetup* is received in response to an *RRCConnectionResumeRequest* from a suspended RRC connection:

2> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity for all established or suspended RBs, except for SRB0;

2> discard the stored UE AS context and *resumeIdentity*;

2> if stored, discard the stored *nextHopChainingCount*;

2> if stored, discard the stored *drb-ContinueROHC*;

2> indicate to upper layers fallback of the RRC connection;

1> if the *RRCConnectionSetup* is received in response to an *RRCConnectionResumeRequest* from RRC\_INACTIVE:

2> stop T380 if running;

2> discard the stored UE Inactive AS context;

2> release *rrc-InactiveConfig*, if configured;

2> discard any current AS security context including the KRRCenc key, the KRRCint key, the KUPint key and the KUPenc key;

2> release radio resources for all established RBs except SRB0, including release of the RLC entities, of the associated PDCP entities and of SDAP entities;

2> release the RRC configuration except for the default L1 parameter values, default MAC main configuration and CCCH;

2> apply the default NR PDCP configuration as specified in TS 38.331 [82], clause 9.2.1.1 for SRB1;

2> use NR PDCP for all subsequent messages received and sent by the UE via SRB1;

2> indicate to upper layers fallback of the RRC connection;

1> if the *RRCConnectionSetup* is received in response to an *RRCConnectionResumeRequest* or *RRCEarlyDataRequest* for transmission using PUR:

2> if *newUE-Identity* is included:

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

2> else:

3> apply the value of the *pur-RNTI* as the C-RNTI;

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> if stored, discard the dedicated offset provided by the *redirectedCarrierOffsetDedicated*;

1> stop timer T300;

1> if T302 is running:

2> stop timer T302;

2> if the UE is connected to 5GC:

3> perform the actions as specified in 5.3.16.4;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> stop timer T306, if running;

1> stop timer T308, if running;

1> perform the actions as specified in 5.3.3.7;

1> stop timer T320, if running;

1> stop timer T350, if running;

1> perform the actions as specified in 5.6.12.4;

1> release *rclwi-Configuration*, if configured, as specified in 5.6.16.2;

1> stop timer T360, if running;

1> stop timer T322, if running;

1> stop timer T331, if running;

1> forward the *dedicatedInfoNAS,* if received, to the upper layers;

1> if T309 is running:

2> stop timer T309 for all access categories;

2> perform the actions as specified in 5.3.16.4.

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 *RRCConnectionSetup**Complete* message as follows:

2> if the *RRCConnectionSetup* is received in response to an *RRCConnectionResumeRequest*:

3> if upper layers provide an S-TMSI:

4> set the *s-TMSI* to the value received from upper layers;

3> else if upper layers provide a 5G-S-TMSI:

4> if the UE is a NB-IoT UE:

5> set the *ng-5G-S-TMSI* to the value received from upper layers;

4> else:

5> set the *ng-5G-S-TMSI-Bits* to *ng-5G-S-TMSI* with the value received from upper layers;

2> else if upper layers provide a 5G-S-TMSI:

3> except for NB-IoT, set the *ng-5G-S-TMSI-Bits* to *ng-5G-S-TMSI-Part2* to the leftmost 8 bits of 5G-S-TMSI received from upper layers;

2> set the *selectedPLMN-Identity* to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35] for E-UTRA/EPC and TS 24.501 [95] for E-UTRA/5GC) from the PLMN(s) included in the *plmn-IdentityList* in *SystemInformationBlockType1* (or *SystemInformationBlockType1-NB* in NB-IoT);

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* andthe *mmec* to the value received from upper layers;

2> if upper layers provided the 'Registered MME':

3> include and set the *gummei-Type* to the value provided by the upper layers;

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

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

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

3> set the *amf-Identifier* to AMF Identifier of the 'Registered AMF' received from upper layers;

2> if upper layers provided the 'Registered AMF':

3> include and set the *guami-Type* to the value provided by the upper layers;

2> if upper layers provide one or more S-NSSAI (see TS 23.003 [27]):

3> include the *s-NSSAI-list* and set the content to the values provided by the upper layers;

2> if the UE supports CIoT EPS optimisation(s):

3> include a*ttachWithoutPDN-Connectivity* if received from upper layers;

3> include *up-CIoT-EPS-Optimisation* if received from upper layers;

3> except for NB-IoT, include *cp-CIoT-EPS-Optimisation* if received from upper layers;

2> if the UE supports CIoT 5GS optimisation(s):

3> for NB-IoT, include *ng-U-DataTransfer* if received from upper layers;

3> except for NB-IoT, include *cp-CIoT-5GS-Optimisatoin* if received from upper layers;

2> if connecting as an RN:

3> include the *rn-SubframeConfigReq*;

2> if the *RRCConnectionSetup* is received in response to *RRCEarlyDataRequest*:

3> set the *dedicatedInfoNAS* to a zero-length octet string;

2> else:

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

2> if the UE is connected to EPC:

3> except for NB-IoT:

4> if the UE has radio link failure or handover failure information available in *VarRLF-Report* and if the RPLMN is included in *plmn-IdentityList* stored in *VarRLF-Report*:

5> include *rlf-InfoAvailable*;

4> if the UE has MBSFN logged measurements available for E-UTRA and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:

5> include *logMeasAvailableMBSFN*;

4> else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:

5> include *logMeasAvailable*;

4> if the UE has Bluetooth logged measurements available and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:

5> include *logMeasAvailableBT*;

4> if the UE has WLAN logged measurements available and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:

5> include *logMeasAvailableWLAN*;

4> if the UE has connection establishment failure information available in *VarConnEstFailReport* and if the RPLMN is equal to *plmn-Identity* stored in *VarConnEstFailReport*:

5> include *connEstFailInfoAvailable*;

4> include the *mobilityState* and set it to the mobility state (as specified in TS 36.304 [4]) of the UE just prior to entering RRC\_CONNECTED state;

4> if the UE has flight path information available:

5> include *flightPathInfoAvailable*;

3> for NB-IoT:

4> if the UE has radio link failure information available in *VarRLF-Report-NB* and if the RPLMN is included in *plmn-IdentityList* stored in *VarRLF-Report*:

5> include *rlf-InfoAvailable*;

4> if the UE has ANR measurements information available in *VarANR-MeasReport-NB* and if the RPLMN is included in *plmn-IdentityList* stored in *VarANR-MeasReport-NB*:

5> include *anr-InfoAvailable*;

3> include *dcn-ID* if a DCN-ID value (see TS 23.401 [41]) is received from upper layers;

2> except for NB-IoT:

3> if the UE supports storage of mobility history information and the UE has mobility history information available in *VarMobilityHistoryReport*:

4> include the *mobilityHistoryAvail*;

3> if the SIB2 contains *idleModeMeasurements*, and the UE has idle/inactive measurement information concerning cells other than the PCell available in *VarMeasIdleReport*:

4> include the *idleMeasAvailable*;

3> if upper layers indicate that access to RLOS is initiated (see TS 23.401 [41] subclause 4.3.8.3):

4> set *rlos-Request* to *true*;

2> if UE needs UL gaps during continuous uplink transmission:

3> include *ue-CE-NeedULGaps*;

2> for NB-IoT:

3> if the UE supports serving cell idle mode measurements reporting and *servingCellMeasInfo* is present in *SystemInformationBlockType2-NB*:

4> set the *measResultServCell* to include the measurements of the serving cell;

NOTE 2: The UE includes the latest results of the serving cell measurements as used for cell selection/ reselection evaluation, which are performed in accordance with the performance requirements as specified in TS 36.133 [16].

2> if connecting as an IAB-node:

3> include *iab-NodeIndication;*

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

1> the procedure ends.

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| Next change |

#### 5.3.7.2 Initiation

The UE shall only initiate the procedure either when AS security has been activated or for a NB-IoT UE supporting RRC connection re-establishment for the Control Plane CIoT EPS/5GS optimisation. The UE initiates the procedure when one of the following conditions is met:

1> upon detecting radio link failure and T316 is not configured, 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> except for UP-EDT, upon integrity check failure indication from lower layers concerning SRB1 or SRB2; or

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

1> upon an RRC connection reconfiguration failure, in accordance with TS38.331 [82], clause 5.3.5.8; or

1> upon detecting radio link failure for the SCG while MCG transmission is suspended, in accordance with TS 38.331 [82] subclause 5.3.10.3 in (NG)EN-DC; or

1> upon SCG change failure while MCG transmission is suspended, in accordance with TS 38.331 [82] subclause 5.3.5.8.3 in (NG)EN-DC; or

1> upon SCG configuration failure while MCG transmission is suspended in accordance with subclause TS 38.331 [82] subclause 5.3.5.8.2 in (NG)EN-DC; or

1> upon integrity check failure indication from SCG lower layers concerning SRB3 while MCG transmission is suspended; or

1> upon T316 expiry, in accordance with sub-clause 5.6.26.5.

NOTE: For UP-EDT, integrity check failure indication from lower layers is handled in accordance with clause 5.3.3.16.

Upon initiation of the procedure, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> stop timer T313, if running;

1> stop timer T316, if running;

1> stop timer T307, if running;

1> start timer T311;

1> stop timer T370, if running;

1> release *uplinkDataCompression*, if configured;

1> suspend all RBs, including RBs configured with NR PDCP, except SRB0;

1> reset MAC;

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

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

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

1> except for NB-IoT, for the MCG, apply the default semi-persistent scheduling configuration as specified in 9.2.3;

1> for NB-IoT, release *schedulingRequestConfig*, if configured;

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

1> release *powerPrefIndicationConfig*, if configured and stop timer T340, if running;

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

1> release *obtainLocationConfig*, if configured;

1> release *idc-Config*, if configured;

1> release *sps-AssistanceInfoReport*, if configured;

1> release *measSubframePatternPCell*, if configured;

1> release the entire SCG configuration, if configured, except for the DRB configuration (as configured by *drb-ToAddModListSCG*);

1> if (NG)EN-DC is configured:

2> perform MR-DC release, as specified in TS 38.331[82], clause 5.3.5.10;

2> release *p-MaxEUTRA*, if configured;

2> release *p-MaxUE-FR1*, if configured;

2> release *tdm-PatternConfig*, if configured;

1> release *naics-Info* for the PCell, if configured;

1> if connected as an RN and configured with an RN subframe configuration:

2> release the RN subframe configuration;

1> release the LWA configuration, if configured, as described in 5.6.14.3;

1> release the LWIP configuration, if configured, as described in 5.6.17.3;

1> release *delayBudgetReportingConfig*, if configured and stop timer T342, if running;

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

1> release *bw-PreferenceIndicationTimer*, if configured and stop timer T341, if running;

1> release *overheatingAssistanceConfig*, if configured and stop timer T345, if running;

1> release *ailc-BitConfig*, if configured;

1> if the UE has a stored *pur-Config* and the UE is re-establishing an RRC connection in a cell different from the cell where *pur-Config* was provided:

2> release *pur-Config*;

2> discard the stored *pur-Config*;

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| Next change |

#### 5.3.7.4 Actions related to transmission of *RRCConnectionReestablishmentRequest* message

If the procedure was initiated due to radio link failure or handover failure, the UE shall:

1> set the *reestablishmentCellId* in the *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT) to the global cell identity of the selected cell;

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

1> except for a NB-IoT UE for which AS security has not been activated, 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);

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);

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

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

3> with the KRRCint 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

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

1> for a NB-IoT UE for which AS security has not been activated, set the *ue-Identity* as follows:

2> request upper layers for calculated ul-NAS-MAC and ul-NAS-Count using the *cellIdentity* indicated in *SystemInformationBlockType1-NB* of the current cell;

2> if the UE is connected to 5GC:

3> set the *truncated5G-S-TMSI* to the truncated 5G-S-TMSI provided by higher layers;

2> else:

3> set the *s-TMSI* to the S-TMSI provided by upper layers;

2> set the *ul-NAS-MAC* to the ul-NAS-MAC value provided by upper layers;

2> set the *ul-NAS-Count* to the ul-NAS-Count value provided by upper layers;

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*;

1> if the UE is a NB-IoT UE:

2> if the UE supports DL channel quality reporting in MSG3 and *cqi-Reporting* is present in *SystemInformationBlockType2-NB*:

3> set the *cqi-NPDCCH* to include the latest results of the downlink channel quality measurements of the carrier where the random access response is received as specified in TS 36.133 [16];

NOTE: The downlink channel quality measurements use measurement period T1 or T2, as defined in TS 36.133 [16].

2> if the UE is connected to EPC, set *earlyContentionResolution* to TRUE;

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

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| Next change |

#### 5.3.8.3 Reception of the *RRCConnectionRelease* by the UE

The UE shall:

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

1> for BL UEs or UEs in CE, delay the following actions defined in this sub-clause 1.25 seconds from the moment the *RRCConnectionRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged, whichever is earlier;

1> for NB-IoT, delay the following actions defined in this sub-clause 10 seconds from the moment the *RRCConnectionRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged, whichever is earlier.

NOTE: For BL UEs, UEs in CE and NB-IoT, when STATUS reporting, as defined in TS 36.322 [7], has not been triggered and the UE has sent positive HARQ feedback (ACK), as defined in TS 36.321 [6], the lower layers can be considered to have indicated that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged.

1> stop T380, if running;

1> for NB -IoT:

2> if the UE has reported *anr-InfoAvailable*, clear *VarANR-MeasConfig-NB* and *VarANR-MeasReport-NB*;

2> if the UE has reported *rlf-InfoAvailable*, clear *VarRLF-Report-NB*;

1> if the *RRCConnectionRelease* message is received in response to an *RRCConnectionResumeRequest* for EDT or for UP transmission using PUR:

2> indicate to upper layers that the suspended RRC connection has been resumed;

2> discard the stored UE AS context and *resumeIdentity*;

2> stop timer T300;

2> stop timer T302, if running;

2> stop timer T303, if running;

2> stop timer T305, if running;

2> stop timer T306, if running;

2> stop timer T308, if running;

2> perform the actions as specified in 5.3.3.7;

2> stop timer T316, if running;

2> stop timer T320, if running;

2> stop timer T322, if running;

1> if ASsecurity is not activated and if UE is connected to 5GC:

2> ignore any field included in *RRCConnectionRelease* message except *waitTime*;

2> perform the actions upon leaving RRC\_CONNECTED or RRC\_INACTIVE as specified in 5.3.12 with the release cause '*other'* upon which the procedure ends;

1> if the *RRCConnectionRelease* message includes *redirectedCarrierInfo* indicating redirection to *geran*; or

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

2> if AS security has not been activated; and

2> if upper layers indicate that redirect to GERAN without AS security is not allowed:

3> ignore the content of the *RRCConnectionRelease*;

3> perform the actions upon leaving RRC\_CONNECTED or RRC\_INACTIVE as specified in 5.3.12, with release cause 'other', upon which the procedure ends;

1> if AS security has not been activated:

2> ignore the content of *redirectedCarrierInfo*, if included and indicating redirection to *nr*;

2> ignore the content of *idleModeMobilityControlInfo*, if included and including *freqPriorityListNR*;

2> if the UE ignores the content of *redirectedCarrierInfo* or of *idleModeMobilityControlInfo*:

3> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'other', upon which the procedure ends;

1> if the *RRCConnectionRelease* message includes *redirectedCarrierInfo* indicating redirection to *eutra* and if UE is connected to 5GC:

2> if *cn-Type* is included:

3> after the cell selection, indicate the available CN Type(s) and the received *cn-Type* to upper layers;

NOTE 1: Handling the case if the E-UTRA cell selected after the redirection does not support the core network type specified by the *cn-Type,* is up to UE implementation.

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

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

2> if the *t320* is included:

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

1> else:

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

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

2> if timer T331 is running:

3> stop timer T331;

3> perform the actions as specified in 5.6.20.3;

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

2> clear *VarMeasIdleConfig* and *VarMeasIdleReport*;

2> store the received *measIdleDuration* in *VarMeasIdleConfig*;

2> start or restart T331 with the value of *measIdleDuration*;

2> if the *measIdleConfig* contains *measIdleCarrierListEUTRA*:

3> store the received *measIdleCarrierListEUTRA* in *VarMeasIdleConfig*;

2> if the *measIdleConfig* contains *measIdleCarrierListNR*:

3> store the received *measIdleCarrierListNR* in *VarMeasIdleConfig*;

2> if the *measIdleConfig* contains *validityAreaList*:

3> store the received *validityAreaList* in *VarMeasIdleConfig*;

2> start performing idle/inactive measurements asspecified in5.6.20;

NOTE 2: If the *measIdleConfig* does not contain *measIdleCarrierListEUTRA* or *measIdleCarrierListNR*, UE may receive *measIdleCarrierListEUTRA* or *measIdleCarrierListNR* as specified in 5.2.2.12.

1> for NB-IoT, if the *RRCConnectionRelease* message includes the *anr-MeasConfig*:

2> store the received *anr-QualityThreshold* in *VarANR-MeasConfig-NB*;

2> if the *anr-MeasConfig* contains *anr-CarrierList*:

3> store the received *anr-CarrierList* in *VarANR-MeasConfig-NB*;

2> set *plmn-IdentityList* in *VarANR-MeasReport-NB* to include the list of EPLMNs stored by the UE (i.e. includes the RPLMN);

2> set *servCellIdentity* in *VarANR-MeasReport-NB* to the global cell identity of the Pcell;

2> start performing ANR measurements as specified in 5.6.24;

1> if the *RRCConnectionRelease* message includes the *pur-Config*:

2> if *pur-Config* is set to *setup*:

3> store or replace the PUR configuration provided by the *pur-Config*;

3> configure MAC in accordance with the *pur-TimeAlignmentTimer*;

3> start maintenance of PUR occasions as specified in 5.3.3.x;

2> else:

3> release *pur-Config*, if configured;

3> discard previously stored *pur-Config*, if any;

3> indicate to lower layers that *pur-Config* is released.

1> for NB-IoT, if the *RRCConnectionRelease* message includes the *redirectedCarrierInfo*:

2> if the *redirectedCarrierOffsetDedicated* isincluded in the *redirectedCarrierInfo*:

3> store the dedicated offsetfor the frequency in *redirectedCarrierInfo*;

3> start timer T322, with the timer value set according to the value of *T322* in *redirectedCarrierInfo*;

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

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

1> else if the *releaseCause* received in the *RRCConnectionRelease* message indicates *cs-FallbackHighPriority*:

2> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'CS Fallback High Priority';

1> else:

2> if the *extendedWaitTime* is present; and

2> if the UE supports delay tolerant access or the UE is a NB-IoT UE:

3> forward the *extendedWaitTime* to upper layers;

2> if the *extendedWaitTime-CPdata* is present and the NB-IoT UE only supports the Control Plane CIoT EPS optimisation:

3> forward the *extendedWaitTime-CPdata* to upper layers;

2> if the *releaseCause* received in the *RRCConnectionRelease* message indicates *rrc-Suspend*:

3> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'RRC suspension';

2> else if *rrc-InactiveConfig* is included:

3> perform the actions upon entering RRC\_INACTIVE as specified in 5.3.8.7;

2> else:

3> perform the actions upon leaving RRC\_CONNECTED or RRC\_INACTIVE as specified in 5.3.12, with release cause 'other';

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| Start of change |

#### 5.3.11.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry; or

1> upon T312 expiry; or

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

1> upon indication from MCG RLC, which is allowed to be send on PCell, that the maximum number of retransmissions has been reached for an SRB or DRB:

2> consider radio link failure to be detected for the MCG i.e. RLF;

2> discard any segments of segmented RRC messages received;

2> if the UE is configured with (NG)EN-DC; and

2> if T316 is configured; and

2> if SCG transmission is not suspended; and

2> if NR PSCell change is not ongoing (i.e. T304 for the NR PSCell is not running as specified in TS 38.331 [82], clause 5.3.5.5.2, in (NG)EN-DC):

3> initiate the MCG failure information procedure as specified in 5.6.26 to report MCG radio link failure;

2> else:

3> store the following radio link failure information in the *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT) by setting its fields as follows:

4> clear the information included in *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT), if any;

4> set the *plmn-IdentityList* to include the list of EPLMNs stored by the UE (i.e. includes the RPLMN);

4> set the *measResultLastServCell* to include the RSRP and RSRQ, if available, of the PCell based on measurements collected up to the moment the UE detected radio link failure;

4> except for NB-IoT, set the *measResultNeighCells* to include the best measured cells, other than the PCell, ordered such that the best cell is listed first, and based on measurements collected up to the moment the UE detected radio link failure, and set its fields as follows;

5> if the UE was configured to perform measurements for one or more EUTRA frequencies, include the *measResultListEUTRA*;

5> if the UE was configured to perform measurement reporting for one or more neighbouring UTRA frequencies, include the *measResultListUTRA*;

5> if the UE was configured to perform measurement reporting for one or more neighbouring GERAN frequencies, include the *measResultListGERAN*;

5> if the UE was configured to perform measurement reporting for one or more neighbouring CDMA2000 frequencies, include the *measResultsCDMA2000*;

5> if the UE was configured to perform measurement reporting for one or more neighbouring NR frequencies, include the *measResultListNR*;

5> for each neighbour cell included, include the optional fields that are available;

NOTE 1: The measured quantities are filtered by the L3 filter as configured in the mobility measurement configuration. The measurements are based on the time domain measurement resource restriction, if configured. Blacklisted cells are not required to be reported.

4> except for NB-IoT, if available, set the *logMeasResultListWLAN* to include the WLAN measurement results, in order of decreasing RSSI for WLAN APs;

4> except for NB-IoT, if available, set the *logMeasResultListBT* to include the Bluetooth measurement results, in order of decreasing RSSI for Bluetooth beacons;

4> if detailed location information is available, set the content of the *locationInfo* as follows:

5> include the locationCoordinates;

5> include the horizontalVelocity, if available;

4> set the *failedPCellId* to the global cell identity, if available, and otherwise , except for NB-IoT, to the physical cell identity and carrier frequency of the PCell where radio link failure is detected;

4> except for NB-IoT, set the *tac-FailedPCell* to the tracking area code, if available, of the PCell where radio link failure is detected;

4> except for NB-IoT, if an *RRCConnectionReconfiguration* message including the *mobilityControlInfo* was received before the connection failure:

5> if the last *RRCConnectionReconfiguration* message including the *mobilityControlInfo* concerned an intra E-UTRA handover:

6> include the *previousPCellId* and set it to the global cell identity of the PCell where the last *RRCConnectionReconfiguration* message including *mobilityControlInfo* was received;

6> set the *timeConnFailure* to the elapsed time since reception of the last *RRCConnectionReconfiguration* message including the *mobilityControlInfo*;

5> if the last *RRCConnectionReconfiguration* message including the *mobilityControlInfo* concerned a handover to E-UTRA from UTRA and if the UE supports Radio Link Failure Report for Inter-RAT MRO:

6> include the *previousUTRA-CellId* and set it to the physical cell identity, the carrier frequency and the global cell identity, if available, of the UTRA Cell in which the last *RRCConnectionReconfiguration* message including *mobilityControlInfo* was received;

6> set the *timeConnFailure* to the elapsed time since reception of the last *RRCConnectionReconfiguration* message including the *mobilityControlInfo*;

4> except for NB-IoT, if the UE supports QCI1 indication in Radio Link Failure Report and has a DRB for which QCI is 1:

5> include the drb-EstablishedWithQCI-1;

4> except for NB-IoT, set the *connectionFailureType* to *rlf*;

4> except for NB-IoT, set the *c-RNTI* to the C-RNTI used in the PCell;

4> except for NB-IoT, set the *rlf-Cause* to the trigger for detecting radio link failure;

3> if AS security has not been activated:

4> if the UE is a NB-IoT UE:

5> if the UE is connected to EPC and the UE supports RRC connection re-establishment for the Control Plane CIoT EPS optimisation; or

5> if the UE is connected to 5GC and the UE supports RRC connection re-establishment for the Control Plane CIoT 5GS optimisation:

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

5> else:

6> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

4> else:

5> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'other';

3> else:

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

In case of DC or NE-DC, the UE shall:

1> upon T313 expiry; or

1> upon random access problem indication from SCG MAC; or

1> upon indication from SCG RLC, which is allowed to be sent on PSCell, that the maximum number of retransmissions has been reached for an SCG, for a split DRB or for a split SRB:

2> consider radio link failure to be detected for the SCG i.e. SCG-RLF;

2> if the UE is configured with DC; or

2> if the UE is configured with NE-DC and MCG transmission is not suspended:

3> initiate the SCG failure information procedure as specified in 5.6.13 to report SCG radio link failure;

2> else:

3> initiate the connection re-establishment procedure as specified in TS 38.331 [82], clause 5.3.7;

In case of CA PDCP duplication, the UE shall:

1> upon indication from an RLC entity, which is restricted to be sent on SCell only, that the maximum number of retransmissions has been reached:

2> initiate the failure information procedure as specified in 5.6.21 to report RLC failure of type duplication;

If *daps-HO* is configured for any DRB and T304 is running, the UE shall:

1> upon T310 expiry; or

1> upon T312 expiry; or

1> upon random access problem indication from source MCG MAC; or

1> upon indication from source MCG RLC, which is allowed to be sent on source PCell, that the maximum number of retransmissions has been reached for an DRB:

2> consider radio link failure to be detected for the source MCG;

2> release the MAC entity for the source PCell;

2> for each DRB configured with *daps-HO*:

3> re-establish the RLC entity for the source PCell;

3> release the RLC entity and the associated DTCH logical channel for the source PCell;

3> reconfigure the DAPS PDCP entity to normal PDCP entity as specified in TS 36.323 [8].

2> for each SRB:

3> release the PDCP entity for the source PCell;

3> release the RLC entity and the associated DCCH logical channel for the source PCell;

2> release the physical channel configuration for the source PCell;

The UE may discard the radio link failure information, i.e. release the UE variable *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT), 48 hours after the radio link failure is detected, upon power off or upon detach, and for NB-IoT, upon entering another RAT.

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| Next change |

### 5.6.0 General

For NB-IoT, only a subset of the procedures described in this sub-clause apply.

Table 5.6.0-1 specifies the procedures that are applicable to NB-IoT. All other procedures are not applicable to NB-IoT; this is not further stated in the corresponding procedures.

Table 5.6.0-1: "Other″ Procedures applicable to a NB-IoT UE

| Sub-clause | Procedures |
| --- | --- |
| 5.6.1 | DL information transfer |
| 5.6.2 | UL information transfer |
| 5.6.3 | UE Capability transfer |
| 5.6.5 | UE information (see NOTE) |
| 5.6.23 | PUR Configuration Request |
| 5.6.24 | Neighbour Relation Reporting for SON ANR in NB-IoT |

NOTE: Not applicable for a UE that only supports the Control Plane CIoT EPS optimisation (see TS 24.301 [35]).

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| Next change |

#### 5.6.5.3 Reception of the *UEInformationRequest* message

Upon receiving the *UEInformationRequest* message, the UE shall, only after successful security activation:

1> if *rach-ReportReq* is set to *true*, set the contents of the *rach-Report* in the *UEInformationResponse* message as follows:

2> set the *numberOfPreamblesSent* to indicate the number of preambles sent by MAC for the last successfully completed random access procedure;

2> if contention resolution was not successful as specified in TS 36.321 [6] for at least one of the transmitted preambles for the last successfully completed random access procedure:

3> set the *contentionDetected* to *true*;

2> else:

3> set the *contentionDetected* to *false*;

2> if the UE is a BL UE or UE in CE:

3> set the *initialCEL* to indicate the initial CE level used for the last successfully completed random access procedure;

2> if the UE is a NB-IoT UE:

3> set the *initialNRSRP-Level* to indicate the NRSRP level of the NPRACH resource selected for the first preamble transmission for the last successfully completed random access procedure;

2> if the UE is a BL UE, UE in CE or NB-IoT UE:

3> if the last successfully completed random access procedure was initiated with EDT PRACH resource and succeeded after receiving EDT fallback indication from lower layers:

4> set the *edt-Fallback* to *true*;

3> else:

4> set the *edt-Fallback* to *false*;

1> if *rlf-ReportReq* is set to *true* and the UE has radio link failure information or handover failure information available in *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT) and if the RPLMN is included in *plmn-IdentityList* stored in *VarRLF-Report*:

2> for NB-IoT, if the global cell identity of the selected cell is the same as the *reestablishmentCellId* in the *VarRLF-Report-NB*:

3> remove the *reestablishmentCellId* from the *VarRLF-Report-NB*;

2> set *timeSinceFailure* in *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT) to the time that elapsed since the last radio link or handover failure in E-UTRA;

2> set the *rlf-Report* in the *UEInformationResponse* message to the value of *rlf-Report* in *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT);

2> discard the *rlf-Report* from *VarRLF-Report* (*VarRLF-Report-NB* in NB-IoT) upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1> except for NB-IoT, if *connEstFailReportReq* is set to *true* and the UE has connection establishment failure information in *VarConnEstFailReport* and if the RPLMN is equal to *plmn-Identity* stored in *VarConnEstFailReport*:

2> set *timeSinceFailure* in *VarConnEstFailReport* to the time that elapsed since the last connection establishment failure in E-UTRA;

2> set the *connEstFailReport* in the *UEInformationResponse* message to the value of *connEstFailReport* in *VarConnEstFailReport*;

2> discard the *connEstFailReport* from *VarConnEstFailReport* upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1> except for NB-IoT, if the *logMeasReportReq* is present and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:

2> if *VarLogMeasReport* includes one or more logged measurement entries, set the contents of the *logMeasReport* in the *UEInformationResponse* message as follows:

3> include the *absoluteTimeStamp* and set it to the value of *absoluteTimeInfo* in the *VarLogMeasReport*;

3> include the *traceReference* and set it to the value of *traceReference* in the *VarLogMeasReport*;

3> include the *traceRecordingSessionRef* and set it to the value of *traceRecordingSessionRef* in the *VarLogMeasReport;*

3> include the *tce-Id* and set it to the value of *tce-Id* in the *VarLogMeasReport*;

3> include the *logMeasInfoList* and set it to include one or more entries from *VarLogMeasReport* starting from the entries logged first;

3> if the *VarLogMeasReport* includes one or more additional logged measurement entries that are not included in the *logMeasInfoList* within the *UEInformationResponse* message:

4> include the *logMeasAvailable*;

3> if the *VarLogMeasReport* includes one or more additional logged Bluetooth measurement entries that are not included in the *logMeasInfoList* within the *UEInformationResponse* message:

4> include the *logMeasAvailableBT*;

3> if the *VarLogMeasReport* includes one or more additional logged WLAN measurement entries that are not included in the *logMeasInfoList* within the *UEInformationResponse* message:

4> include the *logMeasAvailableWLAN*;

1> except for NB-IoT, if *mobilityHistoryReportReq* is set to *true*:

2> include the *mobilityHistoryReport* and set it to include entries from *VarMobilityHistoryReport*;

2> include in the *mobilityHistoryReport* an entry for the current cell, possibly after removing the oldest entry if required, and set its fields as follows:

3> set *visitedCellId* to the global cell identity of the current cell:

3> set field *timeSpent* to the time spent in the current cell;

Editor's note: FFS if the *idleModeMeasurementsReq* indicates all results (EUTRA and NR), or can request only EUTRA or NR results. The procedure below assumes the former.

1> except for NB-IoT, if the *idleModeMeasurementReq* is included in the *UEInformationRequest* and the UE has stored *VarMeasIdleReport*:

2> set the *measResultListIdle* in the *UEInformationResponse* message to the value of *measReportIdle* in the *VarMeasIdleReport*, if measurement information concerning cells other than the PCell is available;

2> set the *measResultListIdleNR* in the *UEInformationResponse* message to the value of *measReportIdleNR* in the *VarMeasIdleReport*, if available;

2> discard the *VarMeasIdleReport* upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1> except for NB-IoT, if *flightPathInfoReq* field is present and the UE has flight path information available:

2> include the *flightPathInfoReport* and set it to include the list of waypoints along the flight path;

2> if the *includeTimeStamp* is set to TRUE:

3> set the field *timeStamp* to the time when UE intends to arrive to each waypoint if this information is available at the UE;

1> for NB-IoT, if *anr-ReportReq* is set to *true* and the UE has *measResultList* available in *VarANR-MeasReport-NB*:

2> set the *anr-MeasReport* in the *UEInformationResponse* message as follows:

3> if the global cell identity of the PCell is different from *servCellIdentity* in the *VarANR-MeasReport-NB*;

4> include the *servCellIdentity* and set it to the value of *servCellIdentity* in the *VarANR-MeasReport-NB*;

3> set *measResultServCell* to the value of *measResultServCell* in the *VarANR-MeasReport-NB*;

3> set *measResultList* to the value of *measResultList* in the *VarANR-MeasReport-NB*;

2> discard the *VarANR-MeasReport-NB* upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1> if the *logMeasReport* is included in the *UEInformationResponse*:

2> submit the *UEInformationResponse* message to lower layers for transmission via SRB2;

2> discard the logged measurement entries included in the *logMeasInfoList* from *VarLogMeasReport* upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1> else:

2> submit the *UEInformationResponse* message to lower layers for transmission via SRB1;

|  |
| --- |
| Next change |

#### 5.6.23.1 General



Figure 5.6.23.1-1: PUR Configuration Request

The purpose of this procedure is to indicate to the E-UTRAN that the UE is interested to be configured with PUR and provide PUR related information to E-UTRAN, or that the UE is UE is no longer interested to be configured with PUR.

The procedure is applicable only for BL UEs, UEs in CE or NB-IoT UEs.

|  |
| --- |
| Next change |

#### 5.6.23.3 Actions related to transmission of *PURConfigurationRequest* message

When initiating the procedure according to 5.6.23.2, the UE shall set the contents of the *PURConfigurationRequest* message as follows:

1> if the UE is interested to be configured with PUR, include *pur-SetupRequest* and set the contents of *pur-SetupRequest* as follows:

2> set *requestedNumOccasions* to the requested number of PUR occasions requested;

2> set *requestedPeriodicity* to the requested periodicity between consecutive PUR occasions;

2> set *requestedTBS* to the requested TBS for the PUR occasion(s);

2> if RRC response message is preferred by the UE for acknowledging the reception of a transmission using PUR, include *rrc-ACK*;

2> set *requestedTimeOffset* to the requested time gap with respect to current time until the first PUR occasion;

1> if the UE is no longer interested to be configured with PUR:

2> include *pur-ReleaseRequest*;

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

|  |
| --- |
| Next change |

#### 5.6.24.0 General

This procedure specifies the neighbour measurements and CGI reading performed when the UE is in RRC\_IDLE when it has an ANR measurement configuration and the storage of the associated information by a UE in RRC\_IDLE and RRC\_CONNECTED.

NOTE: E-UTRAN may retrieve the stored ANR measurements information by means of the UE information procedure.

#### 5.6.24.1 Initiation

While the UE is in RRC\_IDLE, the UE shall:

1> store the measurement results for the serving cell in *measResultServCell* in *VarANR-MeasReport-NB*;

1> while the serving cell global cell identity is the same as stored in *servCellIdentity* in *VarANR-MeasReport-NB*:

2> perform the measurements once in accordance with the following:

3> for each carrier frequency indicated by an entry in *anr-CarrierList,* if present, within *VarANR-MeasConfig-NB*:

4> add a new entry in *measResultList* in *VarANR-MeasReport-NB*;

4> set the *carrierFreq* to the carrier frequency;

4> perform measurements on the corresponding carrier frequency and determines the strongest cell, if any, on the carrier frequency;

NOTE: How the UE performs ANR measurement in RRC\_IDLE is up to UE implementation as long as the measurement requirements (see TS 36.133 [16], subclause 4.6) are met. While performing an ANR measurement, the UE performs inter-frequency measurements on the configured frequency regardless of the measurement rules for cell re-selection and the relaxed monitoring measurement rules as specified in TS 36.304 [4].

4> if the strongest cell is not identified by an entry within the *blackCellList*,if present, for the corresponding entry in *anr-CarrierList*:

5> set the *physCellId* to the physical cell identity of the cell;

5> set the *measResultLastServCell* to the last measurement results of the PCell;

5> set the *measResult* to the measurement results of the cell;

5> if the NRSRP measurement result is above the value provided in *anr-qualityThreshold*:

6> set the *cgi-Info* with the information obtained from the *systemInformationBlockType1-NB* of the cell;

1> release the VarANR-MeasConfig.

The UE may discard the ANR measurements information, i.e. release the UE variables *VarANR-MeasConfig* and *VarANR-MeasReport*, 96 hours after the configuration was received, upon power off or upon detach and upon entering another RAT.

|  |
| --- |
| Next change |

## 6.4 RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

ffsValue INTEGER ::= 65536 -- Placeholder for all FFS value

hiFFS INTEGER ::= 64 -- Highest value of a range that still is FFS. To be removed.

maxAccessCat-1-r15 INTEGER ::= 63 -- Maximum number of Access Categories - 1

maxACDC-Cat-r13 INTEGER ::= 16 -- Maximum number of ACDC categories (per PLMN)

maxAvailNarrowBands-r13 INTEGER ::= 16 -- Maximum number of narrowbands

maxBandComb-r10 INTEGER ::= 128 -- Maximum number of band combinations.

maxBandComb-r11 INTEGER ::= 256 -- Maximum number of additional band combinations.

maxBandComb-r13 INTEGER ::= 384 -- Maximum number of band combinations in Rel-13

maxBands INTEGER ::= 64 -- Maximum number of bands listed in EUTRA UE caps

maxBandsNR-r15 INTEGER ::= 1024 -- Maximum number of NR bands listed in EUTRA UE caps

maxBandwidthClass-r10 INTEGER ::= 16 -- Maximum number of supported CA BW classes per band

maxBandwidthCombSet-r10 INTEGER ::= 32 -- Maximum number of bandwidth combination sets per

-- supported band combination

maxBarringInfoSet-r15 INTEGER ::= 8 -- Maximum number of UAC barring information sets

maxBT-IdReport-r15 INTEGER ::= 32 -- Maximum number of Bluetooth IDs to report

maxBT-Name-r15 INTEGER ::= 4 -- Maximum number of Bluetooth name

maxCBR-Level-r14 INTEGER ::= 16 -- Maximum number of CBR levels

maxCBR-Level-1-r14 INTEGER ::= 15

maxCBR-Report-r14 INTEGER ::= 72 -- Maximum number of CBR results in a report

maxCBR-ReportNR-r16 INTEGER ::= 72 -- Maximum number of CBR results in a report for NR

-- sidelink communication

maxCDMA-BandClass INTEGER ::= 32 -- Maximum value of the CDMA band classes

maxCE-Level-r13 INTEGER ::= 4 -- Maximum number of CE levels

maxCellBlack INTEGER ::= 16 -- Maximum number of blacklisted physical cell identity

-- ranges listed in SIB type 4 and 5

maxCellHistory-r12 INTEGER ::= 16 -- Maximum number of visited EUTRA cells reported

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

maxCellMeasIdle-r15 INTEGER ::= 8 -- Maximum number of neighbouring inter-frequency

-- cells per carrier measured in RRC\_IDLE and RRC\_INACTIVE

maxCellMeasIdle-r16 INTEGER ::= 8 -- Value FFS

maxCombIDC-r11 INTEGER ::= 128 -- Maximum number of reported UL CA or

-- MR-DC combinations

maxCSI-IM-r11 INTEGER ::= 3 -- Maximum number of CSI-IM configurations

-- (per carrier frequency)

maxCSI-IM-r12 INTEGER ::= 4 -- Maximum number of CSI-IM configurations

-- (per carrier frequency)

minCSI-IM-r13 INTEGER ::= 5 -- Minimum number of CSI IM configurations from which

-- REL-13 extension is used

maxCSI-IM-r13 INTEGER ::= 24 -- Maximum number of CSI-IM configurations

-- (per carrier frequency)

maxCSI-IM-v1310 INTEGER ::= 20 -- Maximum number of additional CSI-IM configurations

-- (per carrier frequency)

maxCSI-Proc-r11 INTEGER ::= 4 -- Maximum number of CSI processes (per carrier

-- frequency)

maxCSI-RS-NZP-r11 INTEGER ::= 3 -- Maximum number of CSI RS resource

-- configurations using non-zero Tx power

-- (per carrier frequency)

minCSI-RS-NZP-r13 INTEGER ::= 4 -- Minimum number of CSI RS resource from which

-- REL-13 extension is used

maxCSI-RS-NZP-r13 INTEGER ::= 24 -- Maximum number of CSI RS resource

-- configurations using non-zero Tx power

-- (per carrier frequency)

maxCSI-RS-NZP-v1310 INTEGER ::= 21 -- Maximum number of additional CSI RS resource

-- configurations using non-zero Tx power

-- (per carrier frequency)

maxCSI-RS-ZP-r11 INTEGER ::= 4 -- Maximum number of CSI RS resource

-- configurations using zero Tx power(per carrier

-- frequency)

maxCQI-ProcExt-r11 INTEGER ::= 3 -- Maximum number of additional periodic CQI

-- configurations (per carrier frequency)

maxFreqUTRA-TDD-r10 INTEGER ::= 6 -- Maximum number of UTRA TDD carrier frequencies 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

maxCellListGERAN INTEGER ::= 3 -- Maximum number of lists of GERAN cells

maxCellMeas INTEGER ::= 32 -- Maximum number of entries in each of the

-- cell lists in a measurement object

maxCellReport INTEGER ::= 8 -- Maximum number of reported cells/CSI-RS resources

maxCellSFTD INTEGER ::= 3 -- Maximum number of cells for SFTD reporting

maxCondConfig-r16 INTEGER ::= 8 -- Maximum number of conditional configurations

maxConfigSPS-r14 INTEGER ::= 8 -- Maximum number of simultaneous SPS configurations

maxConfigSPS-r15 INTEGER ::= 6 -- Maximum number of simultaneous SPS configurations

-- configured with SPS C-RNTI

maxCSI-RS-Meas-r12 INTEGER ::= 96 -- Maximum number of entries in the CSI-RS list

-- in a measurement object

maxDRB INTEGER ::= 11 -- Maximum number of Data Radio Bearers

maxDRBExt-r15 INTEGER ::= 4 -- Maximum number of additional DRBs

maxDRB-r15 INTEGER ::= 15 -- Highest value of extended maximum number of DRBs

maxDS-Duration-r12 INTEGER ::= 5 -- Maximum number of subframes in a discovery signals

-- occasion

maxDS-ZTP-CSI-RS-r12 INTEGER ::= 5 -- Maximum number of zero transmission power CSI-RS for

-- a serving cell concerning discovery signals

maxEARFCN INTEGER ::= 65535 -- Maximum value of EUTRA carrier frequency

maxEARFCN-Plus1 INTEGER ::= 65536 -- Lowest value extended EARFCN range

maxEARFCN2 INTEGER ::= 262143 -- Highest value extended EARFCN range

maxEPDCCH-Set-r11 INTEGER ::= 2 -- Maximum number of EPDCCH sets

maxFBI INTEGER ::= 64 -- Maximum value of fequency band indicator

maxFBI-NR-r15 INTEGER ::= 1024 -- Highest value FBI range for NR.

maxFBI-Plus1 INTEGER ::= 65 -- Lowest value extended FBI range

maxFBI2 INTEGER ::= 256 -- Highest value extended FBI range

maxFeatureSets-r15 INTEGER ::= 256 -- Total number of feature sets (size of pool)

maxPerCC-FeatureSets-r15 INTEGER ::= 32 -- Total number of CC-specific feature sets

-- (size of the pool)

maxFFS INTEGER ::= 8 -- Maximum number value FFS

maxFreq INTEGER ::= 8 -- Maximum number of carrier frequencies

maxFreqIDC-r11 INTEGER ::= 32 -- Maximum number of carrier frequencies that are

-- affected by the IDC problems

maxFreqIdle-r15 INTEGER ::= 8 -- Maximum number of carrier frequencies for

-- IDLE mode measurements configured by eNB

maxFreqIdle-r16 INTEGER ::= 8 -- Value FFS

maxFreqMBMS-r11 INTEGER ::= 5 -- Maximum number of carrier frequencies for which an

-- MBMS capable UE may indicate an interest

maxFreqNBIOT-r16 INTEGER ::= 8 -- Maximum number of NB-IoT carrier frequencies that can

-- be provided as assistance information for inter-RAT

-- cell selection

maxFreqNR-r15 INTEGER ::= 5 -- Maximum number of NR carrier frequencies for

-- which a UE may provide measurement results upon

-- NR SCG failure

maxFreqSL-NR-r16 INTEGER ::= 8 -- Maximum number of NR anchor carrier frequencies on

-- which configurations for V2X sidelink communication

-- are provided

maxFreqV2X-r14 INTEGER ::= 8 -- Maximum number of carrier frequencies for which V2X

-- sidelink communication can be configured

maxFreqV2X-1-r14 INTEGER ::= 7 -- Highest index of 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

maxGWUS-Groups-1-r16 INTEGER ::= 31 -- Maximum number of groups minus one for each

-- probability group

maxGWUS-Resources-r16 INTEGER ::= 4 -- Maximum number of GWUS resources for each group

maxGWUS-ProbThresholds-r16 INTEGER ::= 3 -- Maximum number of paging probability thresholds

maxIdleMeasCarriers-r15 INTEGER ::= 3 -- Maximum number of neighbouring inter-

-- frequency carriers measured in RRC\_IDLE and RRC\_INACTIVE

maxLCG-r13 INTEGER ::= 4 -- Maximum number of logical channel groups

maxLogMeasReport-r10 INTEGER ::= 520 -- Maximum number of logged measurement entries

-- that can be reported by the UE in one message

maxMBSFN-Allocations INTEGER ::= 8 -- Maximum number of MBSFN frame allocations with

-- different offset

maxMBSFN-Area INTEGER ::= 8

maxMBSFN-Area-1 INTEGER ::= 7

maxMBMS-ServiceListPerUE-r13 INTEGER ::= 15 -- Maximum number of services which the UE can

-- include in the MBMS interest indication

maxMeasId INTEGER ::= 32

maxMeasId-Plus1 INTEGER ::= 33

maxMeasId-r12 INTEGER ::= 64

maxMultiBands INTEGER ::= 8 -- Maximum number of additional frequency bands

-- that a cell belongs to

maxMultiBandsNR-r15 INTEGER ::= 32 -- Maximum number of additional NR frequency bands

-- that a cell belongs to

maxMultiBandsNR-1-r15 INTEGER ::= 31

maxNS-Pmax-r10 INTEGER ::= 8 -- Maximum number of NS and P-Max values per band

maxNAICS-Entries-r12 INTEGER ::= 8 -- Maximum number of supported NAICS combination(s)

maxNeighCell-r12 INTEGER ::= 8 -- Maximum number of neighbouring cells in NAICS

-- configuration (per carrier frequency)

maxNeighCell-SCPTM-r13 INTEGER ::= 8 -- Maximum number of SCPTM neighbour cells

maxNrofPCI-PerSMTC-r16 INTEGER ::= 64 -- Maximum number of PCIs per SMTC

maxNrofS-NSSAI-r15 INTEGER ::= 8 -- Maximum number of S-NSSAI

maxObjectId INTEGER ::= 32

maxObjectId-Plus1-r13 INTEGER ::= 33

maxObjectId-r13 INTEGER ::= 64

maxP-a-PerNeighCell-r12 INTEGER ::= 3 -- Maximum number of power offsets for a neighbour cell

-- in NAICS configuration

maxPageRec INTEGER ::= 16 --

maxPhysCellIdRange-r9 INTEGER ::= 4 -- Maximum number of physical cell identity ranges

maxPLMN-r11 INTEGER ::= 6 -- Maximum number of PLMNs

maxPLMN-1-r14 INTEGER ::= 5 -- Maximum number of PLMNs minus one

maxPLMN-r15 INTEGER ::= 8 -- Maximum number of PLMNs for RNA configuration

maxPLMN-NR-r15 INTEGER ::= 12 -- Maximum number of NR PLMNs

maxPNOffset INTEGER ::= 511 -- Maximum number of CDMA2000 PNOffsets

maxPMCH-PerMBSFN INTEGER ::= 15

maxPSSCH-TxConfig-r14 INTEGER ::= 16 -- Maximum number of PSSCH TX configurations

maxQuantSetsNR-r15 INTEGER ::= 2 -- Maximum number of NR quantity configuration sets

maxQCI-r13 INTEGER ::= 6 -- Maximum number of QCIs

maxRAT-Capabilities INTEGER ::= 8 -- Maximum number of interworking RATs (incl EUTRA)

maxRE-MapQCL-r11 INTEGER ::= 4 -- Maximum number of PDSCH RE Mapping configurations

-- (per carrier frequency)

maxReportConfigId INTEGER ::= 32

maxReservationPeriod-r14 INTEGER ::= 16 -- Maximum number of resource reservation periodicities

-- for sidelink V2X communication

maxRS-Index-r15 INTEGER ::= 64 -- Maximum number of RS indices

maxRS-Index-1-r15 INTEGER ::= 63 -- Highest value of RS index as used to identify

-- RS index in RRM reports.

maxRS-IndexCellQual-r15 INTEGER ::= 16 -- Maximum number of RS indices averaged to derive

-- cell quality for RRM.

maxRS-IndexReport-r15 INTEGER ::= 32 -- Maximum number of RS indices for RRM.

maxRSTD-Freq-r10 INTEGER ::= 3 -- Maximum number of frequency layers for RSTD

-- measurement

maxSAI-MBMS-r11 INTEGER ::= 64 -- Maximum number of MBMS service area identities

-- broadcast per carrier frequency

maxSCell-r10 INTEGER ::= 4 -- Maximum number of SCells

maxSCell-r13 INTEGER ::= 31 -- Highest value of extended number range of SCells

maxSCellGroups-r15 INTEGER ::= 4 -- Maximum number of SCell common parameter groups

maxSC-MTCH-r13 INTEGER ::= 1023 -- Maximum number of SC-MTCHs in one cell

maxSC-MTCH-BR-r14 INTEGER ::= 128 -- Maximum number of SC-MTCHs in one cell for feMTC

maxSL-CommRxPoolNFreq-r13 INTEGER ::= 32 -- Maximum number of individual sidelink communication

-- Rx resource pools on neighbouring freq

maxSL-CommRxPoolPreconf-v1310 INTEGER ::= 12 -- Maximum number of additional preconfigured

-- sidelink communication Rx resource pool entries

maxSL-TxPool-r12Plus1-r13 INTEGER ::= 5 -- First additional individual sidelink

-- Tx resource pool

maxSL-TxPool-v1310 INTEGER ::= 4 -- Maximum number of additional sidelink

-- Tx resource pool entries

maxSL-TxPool-r13 INTEGER ::= 8 -- Maximum number of individual sidelink

-- Tx resource pools

maxSL-CommTxPoolPreconf-v1310 INTEGER ::= 7 -- Maximum number of additional preconfigured

-- sidelink Tx resource pool entries

maxSL-Dest-r12 INTEGER ::= 16 -- Maximum number of sidelink destinations

maxSL-DiscCells-r13 INTEGER ::= 16 -- Maximum number of cells with similar sidelink

-- configurations

maxSL-DiscPowerClass-r12 INTEGER ::= 3 -- Maximum number of sidelink power classes

maxSL-DiscRxPoolPreconf-r13 INTEGER ::= 16 -- Maximum number of preconfigured sidelink

-- discovery Rx resource pool entries

maxSL-DiscSysInfoReportFreq-r13 INTEGER ::= 8 -- Maximum number of frequencies to include in a

-- SidelinkUEInformation for SI reporting

maxSL-DiscTxPoolPreconf-r13 INTEGER ::= 4 -- Maximum number of preconfigured sidelink

-- discovery Tx resource pool entries

maxSL-GP-r13 INTEGER ::= 8 -- Maximum number of gap patterns that can be requested

-- for a frequency or assigned

maxSL-PoolToMeasure-r14 INTEGER ::= 72 -- Maximum number of TX resource pools for CBR

-- measurement and report

maxSL-PoolToMeasureNR-r16 INTEGER ::= 8 -- Maximum number of resource pool for NR sidelink

-- measurement to measure for each measurement object

maxSL-Prio-r13 INTEGER ::= 8 -- Maximum number of entries in sidelink priority list

maxSL-RxPool-r12 INTEGER ::= 16 -- Maximum number of individual sidelink Rx resource pools

maxSL-Reliability-r15 INTEGER ::= 8 -- Maximum number of entries in sidelink reliability list

maxSL-SyncConfig-r12 INTEGER ::= 16 -- Maximum number of sidelink Sync configurations

maxSL-TF-IndexPair-r12 INTEGER ::= 64 -- Maximum number of sidelink Time Freq resource index

-- pairs

maxSL-TxPool-r12 INTEGER ::= 4 -- Maximum number of individual sidelink Tx resource pools

maxSL-V2X-RxPool-r14 INTEGER ::= 16 -- Maximum number of RX resource pools for

-- V2X sidelink communication

maxSL-V2X-RxPoolPreconf-r14 INTEGER ::= 16 -- Maximum number of RX resource pools for

-- V2X sidelink communication

maxSL-V2X-TxPool-r14 INTEGER ::= 8 -- Maximum number of TX resource pools for

-- V2X sidelink communication

maxSL-V2X-TxPoolPreconf-r14 INTEGER ::= 8 -- Maximum number of TX resource pools for

-- V2X sidelink communication

maxSL-V2X-SyncConfig-r14 INTEGER ::= 16 -- Maximum number of sidelink Sync configurations

-- for V2X sidelink communication

maxSL-V2X-CBRConfig-r14 INTEGER ::= 4 -- Maximum number of CBR range configurations

-- for V2X sidelink communication congestion

-- control

maxSL-V2X-CBRConfig-1-r14 INTEGER ::= 3

maxSL-V2X-TxConfig-r14 INTEGER ::= 64 -- Maximum number of TX parameter configurations

-- for V2X sidelink communication congestion

-- control

maxSL-V2X-TxConfig-1-r14 INTEGER ::= 63

maxSL-V2X-CBRConfig2-r14 INTEGER ::= 8 -- Maximum number of CBR range configurations in

-- pre-configuration for V2X sidelink

-- communication congestion control

maxSL-V2X-CBRConfig2-1-r14 INTEGER ::= 7

maxSL-V2X-TxConfig2-r14 INTEGER ::= 128 -- Maximum number of TX parameter

-- configurations in pre-configuration for V2X

-- sidelink communication congestion control

maxSL-V2X-TxConfig2-1-r14 INTEGER ::= 127

maxSTAG-r11 INTEGER ::= 3 -- Maximum number of STAGs

maxServCell-r10 INTEGER ::= 5 -- Maximum number of Serving cells

maxServCell-r13 INTEGER ::= 32 -- Highest value of extended number range of Serving cells

maxServCellNR-r15 INTEGER ::= 16 -- Maximum number of NR serving cells

maxServiceCount INTEGER ::= 16 -- Maximum number of MBMS services that can be included

-- in an MBMS counting request and response

maxServiceCount-1 INTEGER ::= 15

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

maxSimultaneousBands-r10 INTEGER ::= 64 -- Maximum number of simultaneously aggregated bands

maxSubframePatternIDC-r11 INTEGER ::= 8 -- Maximum number of subframe reservation patterns

-- that the UE can simultaneously recommend to the

-- E-UTRAN for use.

maxTrafficPattern-r14 INTEGER ::= 8 -- Maximum number of periodical traffic patterns

-- that the UE can simultaneously report to the

-- E-UTRAN.

maxUTRA-FDD-Carrier INTEGER ::= 16 -- Maximum number of UTRA FDD carrier frequencies

maxUTRA-TDD-Carrier INTEGER ::= 16 -- Maximum number of UTRA TDD carrier frequencies

maxWayPoint-r15 INTEGER ::= 20 -- Maximum number of flight path information waypoints

maxWLAN-Id-r12 INTEGER ::= 16 -- Maximum number of WLAN identifiers

maxWLAN-Bands-r13 INTEGER ::= 8 -- Maximum number of WLAN bands

maxWLAN-Id-r13 INTEGER ::= 32 -- Maximum number of WLAN identifiers

maxWLAN-Channels-r13 INTEGER ::= 16 -- maximum number of WLAN channels used in

-- WLAN-CarrierInfo

maxWLAN-CarrierInfo-r13 INTEGER ::= 8 -- Maximum number of WLAN Carrier Information

maxWLAN-Id-Report-r14 INTEGER ::= 32 -- Maximum number of WLAN IDs to report

maxWLAN-Name-r15 INTEGER ::= 4 -- Maximum number of WLAN name

-- ASN1STOP

NOTE: The value of maxDRB aligns with SA2.

### – End of EUTRA-RRC-Definitions

-- ASN1START

END

-- ASN1STOP

|  |
| --- |
| Next change |

## 6.7 NB-IoT RRC messages

### 6.7.1 General NB-IoT message structure

-- ASN1START

NBIOT-RRC-Definitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

RRCConnectionReestablishmentReject,

SecurityModeCommand,

SecurityModeComplete,

SecurityModeFailure,

AdditionalSpectrumEmission,

ARFCN-ValueEUTRA-r9,

CarrierFreqsGERAN,

CellGlobalIdEUTRA,

CellIdentity,

C-RNTI,

DedicatedInfoNAS,

DRB-Identity,

InitialUE-Identity,

IntraFreqBlackCellList,

IntraFreqNeighCellList,

I-RNTI-r15,

LocationInfo-r10,

maxAccessCat-1-r15,

maxBands,

maxCellBlack,

maxCellInter,

maxCellIntra,

maxFBI2,

maxFreq,

maxMultiBands,

maxNrofS-NSSAI-r15,

maxPageRec,

maxPLMN-r11,

maxSAI-MBMS-r11,

maxSIB,

maxSIB-1,

MBMS-SAI-r11,

MBMS-SAI-List-r11,

MBMSSessionInfo-r13,

NextHopChainingCount,

NG-5G-S-TMSI-r15,

PagingUE-Identity,

PLMN-Identity,

PLMN-IdentityList2,

P-Max,

PowerRampingParameters,

PreambleTransMax,

PhysCellId,

Q-OffsetRange,

Q-QualMin-r9,

Q-RxLevMin,

ReestabUE-Identity,

RegisteredAMF-r15,

RegisteredMME,

ReselectionThreshold,

ResumeIdentity-r13,

RRC-TransactionIdentifier,

RSRP-Range,

ShortMAC-I,

S-NSSAI-r15,

S-TMSI,

SystemInformationBlockType16-r11,

SystemInfoValueTagSI-r13,

T-Reordering,

TimeAlignmentTimer,

TimeSinceFailure-r11,

TMGI-r9,

TrackingAreaCode,

TrackingAreaCode-5GC-r15,

UAC-AC1-SelectAssistInfo-r15,

DataInactivityTimer-r14

FROM EUTRA-RRC-Definitions;

-- ASN1STOP

#### – *BCCH-BCH-Message-NB*

The *BCCH-BCH-Message-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the UE via BCH on the BCCH logical channel in FDD.

-- ASN1START

BCCH-BCH-Message-NB ::= SEQUENCE {

message BCCH-BCH-MessageType-NB

}

BCCH-BCH-MessageType-NB::= MasterInformationBlock-NB

-- ASN1STOP

#### – *BCCH-BCH-Message-TDD-NB*

The *BCCH-BCH-Message-TDD-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the UE via BCH on the BCCH logical channel in TDD.

-- ASN1START

BCCH-BCH-Message-TDD-NB ::= SEQUENCE {

message BCCH-BCH-MessageType-TDD-NB-r15

}

BCCH-BCH-MessageType-TDD-NB-r15 ::= MasterInformationBlock-TDD-NB-r15

-- ASN1STOP

#### – *BCCH-DL-SCH-Message-NB*

The *BCCH-DL-SCH-Message-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the UE via DL‑SCH on the BCCH logical channel.

-- ASN1START

BCCH-DL-SCH-Message-NB ::= SEQUENCE {

message BCCH-DL-SCH-MessageType-NB

}

BCCH-DL-SCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

systemInformation-r13 SystemInformation-NB,

systemInformationBlockType1-r13 SystemInformationBlockType1-NB

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

#### – *PCCH-Message-NB*

The *PCCH-Message-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the UE on the PCCH logical channel.

-- ASN1START

PCCH-Message-NB ::= SEQUENCE {

message PCCH-MessageType-NB

}

PCCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

paging-r13 Paging-NB

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

#### – *DL-CCCH-Message-NB*

The *DL-CCCH-Message-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the UE on the downlink CCCH logical channel.

-- ASN1START

DL-CCCH-Message-NB ::= SEQUENCE {

message DL-CCCH-MessageType-NB

}

DL-CCCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

rrcConnectionReestablishment-r13 RRCConnectionReestablishment-NB,

rrcConnectionReestablishmentReject-r13 RRCConnectionReestablishmentReject,

rrcConnectionReject-r13 RRCConnectionReject-NB,

rrcConnectionSetup-r13 RRCConnectionSetup-NB,

rrcEarlyDataComplete-r15 RRCEarlyDataComplete-NB-r15,

spare3 NULL, spare2 NULL, spare1 NULL

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

#### – *DL-DCCH-Message-NB*

The *DL-DCCH-Message-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the UE on the downlink DCCH logical channel.

-- ASN1START

DL-DCCH-Message-NB ::= SEQUENCE {

message DL-DCCH-MessageType-NB

}

DL-DCCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

dlInformationTransfer-r13 DLInformationTransfer-NB,

rrcConnectionReconfiguration-r13 RRCConnectionReconfiguration-NB,

rrcConnectionRelease-r13 RRCConnectionRelease-NB,

securityModeCommand-r13 SecurityModeCommand,

ueCapabilityEnquiry-r13 UECapabilityEnquiry-NB,

rrcConnectionResume-r13 RRCConnectionResume-NB,

ueInformationRequest-r16 UEInformationRequest-NB-r16,

spare1 NULL

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

#### – *UL-CCCH-Message-NB*

The *UL-CCCH-Message-NB* class is the set of RRC messages that may be sent from the UE to the E‑UTRAN on the uplink CCCH logical channel.

-- ASN1START

UL-CCCH-Message-NB ::= SEQUENCE {

message UL-CCCH-MessageType-NB

}

UL-CCCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

rrcConnectionReestablishmentRequest-r13 RRCConnectionReestablishmentRequest-NB,

rrcConnectionRequest-r13 RRCConnectionRequest-NB,

rrcConnectionResumeRequest-r13 RRCConnectionResumeRequest-NB,

rrcEarlyDataRequest-r15 RRCEarlyDataRequest-NB-r15

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

#### – *SC-MCCH-Message-NB*

The *SC-MCCH-Message-NB* class is the set of RRC messages that may be sent from the E‑UTRAN to the NB-IoT UE on the SC-MCCH logical channel.

-- ASN1START

SC-MCCH-Message-NB ::= SEQUENCE {

message SC-MCCH-MessageType-NB

}

SC-MCCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

scptmConfiguration-r14 SCPTMConfiguration-NB-r14

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

#### – *UL-DCCH-Message-NB*

The *UL-DCCH-Message-NB* class is the set of RRC messages that may be sent from the UE to the E‑UTRAN on the uplink DCCH logical channel.

-- ASN1START

UL-DCCH-Message-NB ::= SEQUENCE {

message UL-DCCH-MessageType-NB

}

UL-DCCH-MessageType-NB ::= CHOICE {

c1 CHOICE {

rrcConnectionReconfigurationComplete-r13 RRCConnectionReconfigurationComplete-NB,

rrcConnectionReestablishmentComplete-r13 RRCConnectionReestablishmentComplete-NB,

rrcConnectionSetupComplete-r13 RRCConnectionSetupComplete-NB,

securityModeComplete-r13 SecurityModeComplete,

securityModeFailure-r13 SecurityModeFailure,

ueCapabilityInformation-r13 UECapabilityInformation-NB,

ulInformationTransfer-r13 ULInformationTransfer-NB,

rrcConnectionResumeComplete-r13 RRCConnectionResumeComplete-NB,

ueInformationResponse-r16 UEInformationResponse-NB-r16,

purConfigurationRequest-r16 PURConfigurationRequest-NB-r16,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

messageClassExtension SEQUENCE {}

}

-- ASN1STOP

### 6.7.2 NB-IoT Message definitions

#### – *DLInformationTransfer-NB*

The *DLInformationTransfer-NB* message is used for the downlink transfer of NAS dedicated information.

Signalling radio bearer: SRB1or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*DLInformationTransfer-NB* message

-- ASN1START

DLInformationTransfer-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE {

dlInformationTransfer-r13 DLInformationTransfer-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

DLInformationTransfer-NB-r13-IEs ::= SEQUENCE {

dedicatedInfoNAS-r13 DedicatedInfoNAS,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

#### – *MasterInformationBlock-NB*

The *MasterInformationBlock-NB* includes the system information transmitted on BCH in FDD.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E‑UTRAN to UE

*MasterInformationBlock-NB*

-- ASN1START

MasterInformationBlock-NB ::= SEQUENCE {

systemFrameNumber-MSB-r13 BIT STRING (SIZE (4)),

hyperSFN-LSB-r13 BIT STRING (SIZE (2)),

schedulingInfoSIB1-r13 INTEGER (0..15),

systemInfoValueTag-r13 INTEGER (0..31),

ab-Enabled-r13 BOOLEAN,

operationModeInfo-r13 CHOICE {

inband-SamePCI-r13 Inband-SamePCI-NB-r13,

inband-DifferentPCI-r13 Inband-DifferentPCI-NB-r13,

guardband-r13 Guardband-NB-r13,

standalone-r13 Standalone-NB-r13

},

additionalTransmissionSIB1-r15 BOOLEAN,

ab-Enabled-5GC-r16 BOOLEAN,

spare BIT STRING (SIZE (9))

}

Guardband-NB-r13 ::= SEQUENCE {

rasterOffset-r13 ChannelRasterOffset-NB-r13,

spare BIT STRING (SIZE (3))

}

Inband-SamePCI-NB-r13 ::= SEQUENCE {

eutra-CRS-SequenceInfo-r13 INTEGER (0..31)

}

Inband-DifferentPCI-NB-r13 ::= SEQUENCE {

eutra-NumCRS-Ports-r13 ENUMERATED {same, four},

rasterOffset-r13 ChannelRasterOffset-NB-r13,

spare BIT STRING (SIZE (2))

}

Standalone-NB-r13 ::= SEQUENCE {

spare BIT STRING (SIZE (5))

}

-- ASN1STOP

| *MasterInformationBlock-NB* field descriptions |
| --- |
| ***ab-Enabled***  Value TRUE indicates that access barring is enabled for UEs connected to EPC. |
| ***ab-Enabled-5GC***  Value TRUE indicates that access barring is enabled for UEs connected to 5GC. |
| ***additionalTransmissionSIB1***  Value TRUE indicates that additional SIB1-NB transmissions are present. See TS 36.211 [21] and TS 36.213 [23].  E-UTRAN only configures *additionalTransmissionSIB1* to *TRUE* if *schedulingInfoSIB1* indicates that the number of NPDSCH repetitions is 16, see TS 36.213 [23], Table 16.4.1.3-3. |
| ***eutra-CRS-SequenceInfo***  Information of the carrier containing NPSS/NSSS/NPBCH.  Each value is associated with an E-UTRA PRB index as an offset from the middle of the LTE system sorted out by channel raster offset. See TS 36.211[21] and TS 36.213 [23]. |
| ***eutra-NumCRS-Ports***  Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23]. |
| ***hyperSFN-LSB***  Indicates the 2 least significant bits of hyper SFN. The remaining bits are present in *SystemInformationBlockType1-NB.* |
| ***operationModeInfo***  Deployment scenario (in-band/guard-band/standalone) and related information. See TS 36.211 [21] and TS 36.213 [23].  *Inband-SamePCI* indicates an in-band deployment and that the NB-IoT and LTE cell share the same physical cell id and have the same number of NRS and CRS ports.  *Inband-DifferentPCI* indicates an in-band deployment and that the NB-IoT and LTE cell have different physical cell id.  *guardband* indicatesa guard-band deployment.  *standalone* indicates a standalone deployment. |
| ***schedulingInfoSIB1***  This field contains an index to a table specified in TS 36.213 [23], Table 16.4.1.3-3, that defines *SystemInformationBlockType1-NB* scheduling information. |
| ***systemFrameNumber-MSB***  Defines the 4 most significant bits of the SFN. As indicated in TS 36.211 [21], the 6 least significant bits of the SFN are acquired implicitly by decoding the NPBCH. |
| ***systemInfoValueTag***  Common for all SIBs other than MIB-NB, SIB14-NB and SIB16-NB. |

#### *– MasterInformationBlock-TDD-NB*

The *MasterInformationBlock-TDD-NB* includes the system information transmitted on BCH in TDD.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E‑UTRAN to UE

*MasterInformationBlock-TDD-NB*

-- ASN1START

MasterInformationBlock-TDD-NB-r15 ::= SEQUENCE {

systemFrameNumber-MSB-r15 BIT STRING (SIZE (4)),

hyperSFN-LSB-r15 BIT STRING (SIZE (2)),

schedulingInfoSIB1-r15 INTEGER (0..15),

systemInfoValueTag-r15 INTEGER (0..31),

ab-Enabled-r15 BOOLEAN,

operationModeInfo-r15 CHOICE {

inband-SamePCI-r15 Inband-SamePCI-TDD-NB-r15,

inband-DifferentPCI-r15 Inband-DifferentPCI-TDD-NB-r15,

guardband-r15 GuardbandTDD-NB-r15,

standalone-r15 StandaloneTDD-NB-r15

},

sib1-CarrierInfo-r15 ENUMERATED {anchor, non-anchor},

ab-Enabled-5GC-r16 BOOLEAN,

spare BIT STRING (SIZE (8))

}

GuardbandTDD-NB-r15 ::= SEQUENCE {

rasterOffset-r15 ChannelRasterOffset-NB-r13,

sib-GuardbandInfo-r15 CHOICE {

sib-GuardbandAnchor-r15 SIB-GuardbandAnchorTDD-NB-r15,

sib-GuardbandGuardband-r15 SIB-GuardbandGuardbandTDD-NB-r15,

sib-GuardbandInbandSamePCI-r15 SIB-GuardbandInbandSamePCI-TDD-NB-r15,

sib-GuardbandinbandDiffPCI-r15 SIB-GuardbandInbandDiffPCI-TDD-NB-r15

},

eutra-Bandwitdh-r15 ENUMERATED {bw5or10, bw15or20}

}

Inband-SamePCI-TDD-NB-r15 ::= SEQUENCE {

eutra-CRS-SequenceInfo-r15 INTEGER (0..31),

sib-InbandLocation-r15 ENUMERATED {lower, higher}

}

Inband-DifferentPCI-TDD-NB-r15 ::= SEQUENCE {

eutra-NumCRS-Ports-r15 ENUMERATED {same, four},

rasterOffset-r15 ChannelRasterOffset-NB-r13,

sib-InbandLocation-r15 ENUMERATED {lower, higher},

spare BIT STRING (SIZE (2))

}

StandaloneTDD-NB-r15 ::= SEQUENCE {

sib-StandaloneLocation-r15 ENUMERATED {lower, higher},

spare BIT STRING (SIZE (5))

}

SIB-GuardbandAnchorTDD-NB-r15 ::= SEQUENCE {

spare BIT STRING (SIZE (1))

}

SIB-GuardbandGuardbandTDD-NB-r15 ::= SEQUENCE {

sib-GuardbandGuardbandLocation-r15 ENUMERATED {same, opposite}

}

SIB-GuardbandInbandSamePCI-TDD-NB-r15 ::= SEQUENCE {

spare BIT STRING (SIZE (1))

}

SIB-GuardbandInbandDiffPCI-TDD-NB-r15 ::= SEQUENCE {

sib-EUTRA-NumCRS-Ports-r15 ENUMERATED {same, four}

}

-- ASN1STOP

| ***MasterInformationBlock-TDD-NB* field descriptions** |
| --- |
| ***ab-Enabled***  Value TRUE indicates that access barring is enabled for UEs connected to EPC. |
| ***ab-Enabled-5GC***  Value TRUE indicates that access barring is enabled for UEs connected to 5GC. |
| ***eutra-Bandwidth***  EUTRA system bandwidth. Value *bw5or10* corresponds to bandwidth 5 or 10 MHz, value *bw15or20* corresponds to bandwidth 15 or 20 MHz.  If the value of *eutra-Bandwidth* is *bw5or10* and *rasterOffset* is set to *khz7dot5*or *khz-7dot5*, the E-UTRA system bandwidth is 5 MHz.  If the value of *eutra-Bandwidth* is *bw5or10* and *rasterOffset* is set to *khz2dot5* or *khz-2dot5*, the E-UTRA system bandwidth is 10 MHz.  If the value of *eutra-Bandwidth* is *bw15or20* and *rasterOffset* is set to *khz7dot5* or *khz-7dot5*, the E-UTRA system bandwidth is 15 MHz.  If the value of *eutra-Bandwidth* is *bw15or20* and *rasterOffset* is set to *khz2dot5* or *khz-2dot5*, the E-UTRA system bandwidth is 20 MHz.  When the E-UTRA system bandwidth is 5 MHz or 15 MHz, if the value of *sib-GuardbandInfo* is *sib-GuardbandInbandSamePCI* or *sib-GuardbandinbandDiffPCI*, the offset between the anchor carrier and the non-anchor carrier used for SIB1 and/or SI transmission is 45 kHz. |
| ***eutra-CRS-SequenceInfo***  Information of the carrier containing NPSS/NSSS/NPBCH.  Each value is associated with an E-UTRA PRB index as an offset from the middle of the LTE system sorted out by channel raster offset. See TS 36.211 [21] and TS 36.213 [23]. |
| ***eutra-NumCRS-Ports, sib-eutra-NumCRS-Ports***  Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23]. |
| ***hyperSFN-LSB***  Indicates the 2 least significant bits of hyper SFN. The remaining bits are present in *SystemInformationBlockType1-NB.* |
| ***operationModeInfo***  Deployment scenario (in-band/guard-band/standalone) and related information. See TS 36.211 [21] and TS 36.213 [23].  *Inband-SamePCI* indicates an in-band deployment and that the NB-IoT and LTE cell share the same physical cell id and have the same number of NRS and CRS ports.  *Inband-DifferentPCI* indicates an in-band deployment and that the NB-IoT and LTE cell have different physical cell id.  *guardband* indicatesa guard-band deployment.  *standalone* indicates a standalone deployment.  When *operationmodeInfo* is set to *guardband,* if *rasterOffset* is set to *khz-7dot5* or *khz-2dot5,* the guardband anchor carrier is at the higher edge of the LTE carrier. If *rasterOffset* is set to *khz7dot5* or *khz2dot5*, the guardband anchor carrier is at the lower edge of the LTE carrier |
| ***schedulingInfoSIB1***  This field contains an index to a table specified in TS 36.213 [23], Table 16.4.1.3-5 or Table 16.4.1.3-7 when *sib1-CarrierInfo* is set to *anchor* or to *non-anchor* respectively, that defines *SystemInformationBlockType1-NB* scheduling information.  If *sib1-CarrierInfo* is set to non-anchor, E-UTRAN configures a value between 0 and 7. |
| ***sib-GuardbandGuardbandLocation***  Location of the non-anchor carrier used for SIB1 and/or SI transmission when *operationmodeInfo* is set to *guardband* and the non-anchor carrier is in guardband. See TS 36.213 [23].  Value *same* corresponds to the carrier adjacent to the anchor carrier on the outer side of the guardband, value *opposite* corresponds to the carrier closest to the edge of the LTE carrier in the opposite guardband. |
| ***sib-GuardbandInfo***  Information of the carrier used for SIB1 and/or SI transmission when *operationmodeInfo* is set to *guardband*. See TS 36.213 [23].  *sib-GuardbandAnchor* indicates the anchor carrier.  *sib-GuardbandGuardband* indicates a non-anchor carrier in guardband mode.  *sib-GuardbandInbandSamePCI* or *sib-GuardbandinbandDiffPCI* indicates a non-anchor carrier in inband mode, and at the edge of the LTE carrier and on the same side as the anchor carrier. |
| ***sib-InbandLocation***  Location of the non-anchor carrier used for SIB1 and/or SI transmission when *operationmodeInfo* is set to *inband-SamePCI* or *inband-DifferentPCI*,and *sib1-CarrierInfo* value and/or *tdd-SI-CarrierInfo* in SIB1-NB is set to *non-anchor*. See TS 36.213 [23].  Value *lower* corresponds to the lower adjacent carrier relative to the anchor carrier and value *higher* corresponds to the higher adjacent carrier relative to the anchor carrier.  If both *sib1-CarrierInfo* value and *tdd-SI-CarrierInfo* value in SIB1-NB are set to *anchor,* the UE ignores *sib-InbandLocation*. |
| ***sib-StandaloneLocation***  Location of the non-anchor carrier used for SIB1 and/or SI transmission when *operationmodeInfo* is set to *standalone*,and *sib1-CarrierInfo* value and/or *tdd-SI-CarrierInfo* in SIB1-NB is set to *non-anchor*. See TS 36.213 [23].  Value *lower* corresponds to the lower adjacent carrier relative to the anchor carrier and value *higher* corresponds to the higher adjacent carrier relative to the anchor carrier.  If both *sib1-CarrierInfo* value and *tdd-SI-CarrierInfo* value in SIB1-NB are set to *anchor,* the UE ignores *sib-StandaloneLocation*. |
| ***sib1-CarrierInfo***  Carrier used for SIB1 transmission. See TS 36.213 [23], clause 16.4.1.3. Value *anchor* corresponds to anchor carrier, value *non-anchor* corresponds to non-anchor carrier. |
| ***systemFrameNumber-MSB***  Defines the 4 most significant bits of the SFN. As indicated in TS 36.211 [21], the 6 least significant bits of the SFN are acquired implicitly by decoding the NPBCH. |
| ***systemInfoValueTag***  Common for all SIBs other than MIB-NB, SIB14-NB and SIB16-NB. |

#### – *Paging-NB*

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

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: PCCH

Direction: E‑UTRAN to UE

*Paging-NB* message

-- ASN1START

Paging-NB ::= SEQUENCE {

pagingRecordList-r13 PagingRecordList-NB-r13 OPTIONAL, -- Need ON

systemInfoModification-r13 ENUMERATED {true} OPTIONAL, -- Need ON

systemInfoModification-eDRX-r13 ENUMERATED {true} OPTIONAL, -- Need ON

nonCriticalExtension SEQUENCE {} OPTIONAL

}

PagingRecordList-NB-r13 ::= SEQUENCE (SIZE (1..maxPageRec)) OF PagingRecord-NB-r13

PagingRecord-NB-r13 ::= SEQUENCE {

ue-Identity-r13 PagingUE-Identity,

...,

[[

mt-EDT-r16 ENUMERATED {true} OPTIONAL -- Need ON

]]

}

-- ASN1STOP

| *Paging-NB* field descriptions |
| --- |
| ***mt-EDT***  Indication of mobile-terminated EDT. |
| ***systemInfoModification***  If present: indication of a BCCH modification other than for *SystemInformationBlockType14-NB* (SIB14-NB) and *SystemInformationBlockType16-NB* (SIB16-NB). This indication does not apply to UEs using eDRX cycle longer than the BCCH modification period. |
| ***systemInfoModification-eDRX***  If present: indication of a BCCH modification other than for *SystemInformationBlockType14-NB* (SIB14-NB) and *SystemInformationBlockType16-NB* (SIB16-NB). This indication applies only to UEs using eDRX cycle longer than the BCCH modification period. |
| ***ue-Identity***  Provides the NAS identity of the UE that is being paged. |

#### – *PURConfigurationRequest-NB*

The *PURConfigurationRequest-NB* message is used by the UE to transfer PUR related information to the E-UTRAN.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

*PURConfigurationRequest-NB message*

-- ASN1START

PURConfigurationRequest-NB-r16 ::= SEQUENCE {

criticalExtensions CHOICE {

purConfigurationRequest-r16 PURConfigurationRequest-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

PURConfigurationRequest-NB-r16-IEs ::= SEQUENCE {

pur-ConfigRequest-r16 PUR-ConfigRequest-NB-r16 OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

PUR-ConfigRequest-NB-r16 ::= CHOICE{

pur-ReleaseRequest NULL,

pur-SetupRequest SEQUENCE {

requestedNumOccasions-r16 ENUMERATED {one, infinite},

requestedPeriodicity-r16 ENUMERATED {hsf8, hsf16, hsf32, hsf64, hsf128, hsf256,

hsf512, hsf1024, hsf2048, hsf4096, hsf8192,

spare5, spare4, spare3, spare2, spare1},

requestedTBS-r16 ENUMERATED {b328, tbs2, tbs3, tbs4},

requestedTimeOffset-r16 ENUMERATED {value1, value2, value3, value4} OPTIONAL,

rrc-ACK-r16 ENUMERATED {true} OPTIONAL,

}

}

-- ASN1STOP

| *PURConfigurationRequest-NB* field descriptions |
| --- |
| ***requestedNumOccasions***  This field indicates the requested number of PUR occasions. Value *one* corresponds to one occasion and value *infinite* corresponds to infinite occasions. |
| ***requestedPeriodicity***  This field indicates the requested periodicity of PUR occasions in units of H-SFN. Value *hsf8* corresponds to 8 hyper system frames, value *hsf16* corresponds to 16 hyper system frames, and so on. |
| ***requestedTBS***  This field indicates the requested TBS. Value *b328* corresponds to 328 bits, value *tbs2* corresponds to tbs2 bits, and so on. |
| ***requestedTimeOffset***  This field indicates the requested time offset for the first PUR occasion, i.e. the requested time gap from transmission of PUR request until the first PUR occasion. Value FFS. |
| ***rrc-ACK***  Presence of this field indicates that a RRC response message for transmission using PUR is requested. |

#### – *RRCConnectionReconfiguration-NB*

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

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*RRCConnectionReconfiguration-NB* message

-- ASN1START

RRCConnectionReconfiguration-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE{

rrcConnectionReconfiguration-r13 RRCConnectionReconfiguration-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionReconfiguration-NB-r13-IEs ::= SEQUENCE {

dedicatedInfoNASList-r13 SEQUENCE (SIZE(1..maxDRB-NB-r13)) OF

DedicatedInfoNAS OPTIONAL, -- Need ON

radioResourceConfigDedicated-r13 RadioResourceConfigDedicated-NB-r13 OPTIONAL, -- Need ON

fullConfig-r13 ENUMERATED {true} OPTIONAL, -- Cond Reestab

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionReconfiguration-NB* 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. |
| ***fullConfig***  Indicates the full configuration option is applicable for the RRC Connection Reconfiguration message. |

| Conditional presence | Explanation |
| --- | --- |
| *Reestab* | This field is optionally present, need ON upon the first reconfiguration after RRC connection re-establishment; otherwise the field is not present. |

#### – *RRCConnectionReconfigurationComplete-NB*

The *RRCConnectionReconfigurationComplete-NB* message is used to confirm the successful completion of an RRC connection reconfiguration.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*RRCConnectionReconfigurationComplete-NB* message

-- ASN1START

RRCConnectionReconfigurationComplete-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcConnectionReconfigurationComplete-r13 RRCConnectionReconfigurationComplete-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionReconfigurationComplete-NB-r13-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

#### – *RRCConnectionReestablishment-NB*

The *RRCConnectionReestablishment-NB* message is used to re-establish SRB1.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E‑UTRAN to UE

*RRCConnectionReestablishment-NB* message

-- ASN1START

RRCConnectionReestablishment-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE{

rrcConnectionReestablishment-r13 RRCConnectionReestablishment-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionReestablishment-NB-r13-IEs ::= SEQUENCE {

radioResourceConfigDedicated-r13 RadioResourceConfigDedicated-NB-r13,

nextHopChainingCount-r13 NextHopChainingCount,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionReestablishment-NB-v1430-IEs OPTIONAL

}

RRCConnectionReestablishment-NB-v1430-IEs ::= SEQUENCE {

dl-NAS-MAC BIT STRING (SIZE (16)) OPTIONAL, -- Cond Reestablish-CP

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionReestablishment-NB* field descriptions |
| --- |
| ***dl-NAS-MAC***  Downlink authentication token, see TS 33.401 [32]. If this field is present, the UE shall ignore the field *nextHopChainingCount*. |

| Conditional presence | Explanation |
| --- | --- |
| *Reestablish-CP* | This field is mandatory present for NB-IoT UE using the Control Plane CIoT EPS/5GS optimisation; otherwise the field is not present. |

#### – *RRCConnectionReestablishmentComplete-NB*

The *RRCConnectionReestablishmentComplete-NB* message is used to confirm the successful completion of an RRC connection re-establishment.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*RRCConnectionReestablishmentComplete-NB* message

-- ASN1START

RRCConnectionReestablishmentComplete-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcConnectionReestablishmentComplete-r13 RRCConnectionReestablishmentComplete-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionReestablishmentComplete-NB-r13-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionReestablishmentComplete-NB-v1470-IEs OPTIONAL

}

RRCConnectionReestablishmentComplete-NB-v1470-IEs ::= SEQUENCE {

measResultServCell-r14 MeasResultServCell-NB-r14 OPTIONAL,

nonCriticalExtension RRCConnectionReestablishmentComplete-NB-v16xy-IEs OPTIONAL

}

RRCConnectionReestablishmentComplete-NB-v16xy-IEs ::= SEQUENCE {

rlf-InfoAvailable-r16 ENUMERATED {true} OPTIONAL,

anr-InfoAvailable-r16 ENUMERATED {true} OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionReestablishmentComplete-NB field descriptions* |
| --- |
| ***anr-InfoAvailable***  This field is used to indicate the availability of ANR measurement information. |
| ***measResultServCell***  This field refers to the last idle mode measurement results taken of the serving cell. |
| ***rlf-InfoAvailable***  This field is used to indicate the availability of radio link failure related information. |

#### – *RRCConnectionReestablishmentRequest-NB*

The *RRCConnectionReestablishmentRequest-NB* 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-NB* message

-- ASN1START

RRCConnectionReestablishmentRequest-NB ::= SEQUENCE {

criticalExtensions CHOICE {

rrcConnectionReestablishmentRequest-r13

RRCConnectionReestablishmentRequest-NB-r13-IEs,

later CHOICE {

rrcConnectionReestablishmentRequest-r14

RRCConnectionReestablishmentRequest-NB-r14-IEs,

later CHOICE {

rrcConnectionReestablishmentRequest-r16

RRCConnectionReestablishmentRequest-5GC-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

}

}

RRCConnectionReestablishmentRequest-NB-r13-IEs ::= SEQUENCE {

ue-Identity-r13 ReestabUE-Identity,

reestablishmentCause-r13 ReestablishmentCause-NB-r13,

cqi-NPDCCH-r14 CQI-NPDCCH-NB-r14,

earlyContentionResolution-r14 BOOLEAN,

spare BIT STRING (SIZE (20))

}

RRCConnectionReestablishmentRequest-NB-r14-IEs ::= SEQUENCE {

ue-Identity-r14 ReestabUE-Identity-CP-NB-r14,

reestablishmentCause-r14 ReestablishmentCause-NB-r13,

cqi-NPDCCH-r14 CQI-NPDCCH-Short-NB-r14,

earlyContentionResolution-r14 BOOLEAN,

spare BIT STRING (SIZE (1))

}

RRCConnectionReestablishmentRequest-5GC-NB-r16-IEs ::= SEQUENCE {

ue-Identity-r16 ReestabUE-Identity-CP-5GC-NB-r16,

reestablishmentCause-r16 ReestablishmentCause-NB-r13,

cqi-NPDCCH-r16 CQI-NPDCCH-Short-NB-r14,

spare BIT STRING (SIZE (1))

}

ReestablishmentCause-NB-r13 ::= ENUMERATED {

reconfigurationFailure, otherFailure,

spare2, spare1}

ReestabUE-Identity-CP-NB-r14 ::= SEQUENCE {

s-TMSI-r14 S-TMSI,

ul-NAS-MAC-r14 BIT STRING (SIZE (16)),

ul-NAS-Count-r14 BIT STRING (SIZE (5))

}

ReestabUE-Identity-CP-5GC-NB-r16 ::= SEQUENCE {

truncated5G-S-TMSI-r16 BIT STRING (SIZE (40)),

ul-NAS-MAC-r16 BIT STRING (SIZE (16)),

ul-NAS-Count-r16 BIT STRING (SIZE (5))

}

-- ASN1STOP

| *RRCConnectionReestablishmentRequest-NB* field descriptions |
| --- |
| ***earlyContentionResolution***  Value TRUE indicates UE supports MAC PDU containing the UE contention resolution identity MAC control element without RRC response message. This field is always set to TRUE in this version of the specification. |
| ***reestablishmentCause***  Indicates the failure cause that triggered the re-establishment procedure.  eNB is not expected to reject a *RRCConnectionReestablishmentRequest* due to unknown cause value being used by the UE. |
| ***truncated5G-S-TMSI***  For description of this field see TS 23.003 [27]. |
| ***ue-Identity***  UE identity included to retrieve UE context and to facilitate contention resolution by lower layers. |
| ***ul-NAS-Count***  For description of this field see TS 33.401 [32] for EPC, and TS 33.501 [86] for 5GC. |
| ***ul-NAS-MAC***  For description of this field see TS 33.401 [32] for EPC, and TS 33.501 [86] for 5GC. |

#### – *RRCConnectionReject-NB*

The *RRCConnectionReject-NB* message is used to reject the RRC connection establishment or RRC connection resume or to reject the EDT procedure.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E‑UTRAN to UE

*RRCConnectionReject-NB* message

-- ASN1START

RRCConnectionReject-NB ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE {

rrcConnectionReject-r13 RRCConnectionReject-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionReject-NB-r13-IEs ::= SEQUENCE {

extendedWaitTime-r13 INTEGER (1..1800),

rrc-SuspendIndication-r13 ENUMERATED {true} OPTIONAL, -- Need ON

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionReject-NB* field descriptions |
| --- |
| ***extendedWaitTime***  Value in seconds. |
| ***rrc-SuspendIndication***  If present, this field indicates that the UE should remain suspended and not release its stored context. |

#### – *RRCConnectionRelease-NB*

The *RRCConnectionRelease-NB* message is used to command the release of an RRC connection, or to complete an UP-EDT procedure.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*RRCConnectionRelease-NB* message

-- ASN1START

RRCConnectionRelease-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE {

rrcConnectionRelease-r13 RRCConnectionRelease-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionRelease-NB-r13-IEs ::= SEQUENCE {

releaseCause-r13 ReleaseCause-NB-r13,

resumeIdentity-r13 ResumeIdentity-r13 OPTIONAL, -- Need OR

extendedWaitTime-r13 INTEGER (1..1800) OPTIONAL, -- Need ON

redirectedCarrierInfo-r13 RedirectedCarrierInfo-NB-r13 OPTIONAL, -- Need ON

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionRelease-NB-v1430-IEs OPTIONAL

}

RRCConnectionRelease-NB-v1430-IEs ::= SEQUENCE {

redirectedCarrierInfo-v1430 RedirectedCarrierInfo-NB-v1430 OPTIONAL, -- Cond Redirection

extendedWaitTime-CPdata-r14 INTEGER (1..1800) OPTIONAL, -- Cond NoExtendedWaitTime

nonCriticalExtension RRCConnectionRelease-NB-v1530-IEs OPTIONAL

}

RRCConnectionRelease-NB-v1530-IEs ::= SEQUENCE {

drb-ContinueROHC-r15 ENUMERATED {true} OPTIONAL, -- Cond UP-EDT

nextHopChainingCount-r15 NextHopChainingCount OPTIONAL, -- Cond EarlySec

nonCriticalExtension RRCConnectionRelease-NB-v1550-IEs OPTIONAL

}

RRCConnectionRelease-NB-v1550-IEs ::= SEQUENCE {

redirectedCarrierInfo-v1550 RedirectedCarrierInfo-NB-v1550 OPTIONAL, -- Cond Redirection-TDD

nonCriticalExtension RRCConnectionRelease-NB-v16xy-IEs OPTIONAL

}

RRCConnectionRelease-NB-v16xy-IEs ::= SEQUENCE {

resumeIdentity-r16 I-RNTI-r15 OPTIONAL, -- Need OR

anr-MeasConfig-r16 ANR-MeasConfig-NB-r16 OPTIONAL, -- Need ON

pur-Config-r16 SetupRelease {PUR-Config-NB-r16} OPTIONAL, -- Need ON

nonCriticalExtension SEQUENCE {} OPTIONAL

}

ReleaseCause-NB-r13 ::= ENUMERATED {loadBalancingTAUrequired, other,

rrc-Suspend, spare1}

RedirectedCarrierInfo-NB-r13::= CarrierFreq-NB-r13

RedirectedCarrierInfo-NB-v1430 ::= SEQUENCE {

redirectedCarrierOffsetDedicated-r14 ENUMERATED{

dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10,

dB12, dB14, dB16, dB18, dB20, dB22, dB24, dB26},

t322-r14 ENUMERATED{

min5, min10, min20, min30, min60, min120, min180,

spare1}

}

RedirectedCarrierInfo-NB-v1550::= CarrierFreq-NB-v1550

-- ASN1STOP

| *RRCConnectionRelease-NB* field descriptions |
| --- |
| ***anr-MeasConfig***  Configuration of the measurements to be performed by the UE in RRC\_IDLE for ANR. |
| ***drb-ContinueROHC***  This field indicates whether to continue or reset the header compression protocol context for the DRBs configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues when UE initiates UP-EDT in the same cell, while absence indicates that the header compression protocol context is reset. |
| ***extendedWaitTime***  Value in seconds. |
| ***extendedWaitTime-CPdata***  Wait time for data transfer using the Control Plane CIoT EPS optimisation. Value in seconds. See TS 24.301 [35]. |
| ***redirectedCarrierInfo***  The r*edirectedCarrierInfo* indicates a carrier frequency (downlink for FDD) and is used to redirect the UE to a NB-IoT carrier frequency, by means of the cell selection upon leaving RRC\_CONNECTED as specified in TS 36.304 [4]. |
| ***redirectedCarrierOffsetDedicated***  Parameter "Qoffsetdedicatedfrequency" in TS 36.304 [4]. For NB-IoT carrier frequencies, a UE that supports multi-band cells considers the *redirectedCarrierOffsetDedicated* to be common for all overlapping bands (i.e. regardless of the EARFCN that is used). |
| ***releaseCause***  The *releaseCause* is used to indicate the reason for releasing the RRC Connection.  E-UTRAN should not set the *releaseCause* to *loadBalancingTAURequired* if the *extendedWaitTime* is present. The network should not set the *releaseCause* to *loadBalancingTAURequired* if the UE is connected to 5GC. |
| ***t322***  Timer T322 as described in clause 7.3. Value minN corresponds to N minutes. |

| Conditional presence | Explanation |
| --- | --- |
| *NoExtendedWaitTime* | The field is optionally present, Need ON, if the *extendedWaitTime* is not included; otherwise the field is not present. |
| *Redirection* | The field is optionally present, Need ON, if *redirectedCarrierInfo* is included; otherwise the field is not present. |
| *Redirection-TDD* | The field is optionally present, Need ON, if *redirectedCarrierInfo* is included in TDD mode. Otherwise, the field is not present. |
| *UP-EDT* | The field is optionally present, Need ON, if the UE supports UP-EDT or UP transmission using PUR and *releaseCause* is set to *rrc-Suspend*; otherwise the field is not present. |
| *EarlySec* | For EPC, the field is optionally present, Need ON, if the UE supports early security reactivation or UP-EDT or UP transmission using PUR and *releaseCause* is set to *rrc-Suspend*; otherwise the field is not present.  For 5GC, the field is mandatory present if *releaseCause* is set to *rrc-Suspend*; otherwise the field is not present. |

#### – *RRCConnectionRequest-NB*

The *RRCConnectionRequest-NB* message is used to request the establishment of an RRC connection.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E‑UTRAN

*RRCConnectionRequest-NB* message

-- ASN1START

RRCConnectionRequest-NB ::= SEQUENCE {

criticalExtensions CHOICE {

rrcConnectionRequest-r13 RRCConnectionRequest-NB-r13-IEs,

later CHOICE {

rrcConnectionRequest-r16 RRCConnectionRequest-5GC-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

}

RRCConnectionRequest-NB-r13-IEs ::= SEQUENCE {

ue-Identity-r13 InitialUE-Identity,

establishmentCause-r13 EstablishmentCause-NB-r13,

multiToneSupport-r13 ENUMERATED {true} OPTIONAL,

multiCarrierSupport-r13 ENUMERATED {true} OPTIONAL,

earlyContentionResolution-r14 BOOLEAN,

cqi-NPDCCH-r14 CQI-NPDCCH-NB-r14,

spare BIT STRING (SIZE (17))

}

RRCConnectionRequest-5GC-NB-r16-IEs ::= SEQUENCE {

ue-Identity-r16 InitialUE-Identity-5GC-NB-r16,

establishmentCause-r16 ENUMERATED {

mt-Access, mo-Signalling, mo-Data, mo-ExceptionData,

spare4, spare3, spare2, spare1},

cqi-NPDCCH-r16 CQI-NPDCCH-NB-r14,

spare BIT STRING (SIZE (11))

}

InitialUE-Identity-5GC-NB-r16 ::= CHOICE {

ng-5G-S-TMSI-r16 NG-5G-S-TMSI-r15,

randomValue BIT STRING (SIZE (48))

}

-- ASN1STOP

| *RRCConnectionRequest-NB* field descriptions |
| --- |
| ***earlyContentionResolution***  Value TRUE indicates UE supports MAC PDU containing the UE contention resolution identity MAC control element without RRC response message. This field is always set to TRUE in this version of the specification. |
| ***establishmentCause***  Provides the establishment cause for the RRC connection request as provided by the upper layers.  eNB is not expected to reject a *RRCConnectionRequest* due to unknown cause value being used by the UE. |
| ***multiCarrierSupport***  If present, this field indicates that the UE supports multi-carrier operation in the mode, FDD or TDD, used for access. |
| ***multiToneSupport***  If present, this field indicates that the UE supports UL multi-tone transmissions on NPUSCH in the mode, FDD or TDD, used for access. |
| ***randomValue***  Integer value in the range 0 to 248 − 1. |
| ***ue-Identity***  UE identity included to facilitate contention resolution by lower layers. |

#### – *RRCConnectionResume-NB*

The *RRCConnectionResume-NB* message is used to resume the suspended RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*RRCConnectionResume-NB* message

-- ASN1START

RRCConnectionResume-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE {

rrcConnectionResume-r13 RRCConnectionResume-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionResume-NB-r13-IEs ::= SEQUENCE {

radioResourceConfigDedicated-r13 RadioResourceConfigDedicated-NB-r13 OPTIONAL, -- Need ON

nextHopChainingCount-r13 NextHopChainingCount,

drb-ContinueROHC-r13 ENUMERATED {true} OPTIONAL, -- Need OP

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionResume-NB-v16xy-IEs OPTIONAL

}

RRCConnectionResume-NB-v16xy-IEs ::= SEQUENCE {

fullConfig-r16 ENUMERATED {true} OPTIONAL, -- Cond 5GC

newUE-Identity-r16 C-RNTI OPTIONAL, -- Need OP

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionResume-NB* field descriptions |
| --- |
| ***drb-ContinueROHC***  This field indicates whether to continue or reset the header compression protocol context for the DRBs configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues while absence indicates that the header compression protocol context is reset. |
| ***fullConfig***  Indicates that the full configuration option is applicable for the *RRCConnectionResume-NB* message. |
| ***newUE-Identity***  C-RNTI used in RRC connection, see TS 36.321 [6]. |

| Conditional presence | Explanation |
| --- | --- |
| *5GC* | The field is optionally present, Need ON, if the UE is connected to 5GC; otherwise the field is not present. |

#### – *RRCConnectionResumeComplete-NB*

The *RRCConnectionResumeComplete-NB* message is used to confirm the successful completion of an RRC connection resumption

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*RRCConnectionResumeComplete-NB* message

-- ASN1START

RRCConnectionResumeComplete-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcConnectionResumeComplete-r13 RRCConnectionResumeComplete-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionResumeComplete-NB-r13-IEs ::= SEQUENCE {

selectedPLMN-Identity-r13 INTEGER (1..maxPLMN-r11) OPTIONAL,

dedicatedInfoNAS-r13 DedicatedInfoNAS OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionResumeComplete-NB-v1470-IEs OPTIONAL

}

RRCConnectionResumeComplete-NB-v1470-IEs ::= SEQUENCE {

measResultServCell-r14 MeasResultServCell-NB-r14 OPTIONAL,

nonCriticalExtension RRCConnectionResumeComplete-NB-v16xy-IEs OPTIONAL

}

RRCConnectionResumeComplete-NB-v16xy-IEs ::= SEQUENCE {

rlf-InfoAvailable-r16 ENUMERATED {true} OPTIONAL,

anr-InfoAvailable-r16 ENUMERATED {true} OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionResumeComplete-NB* field descriptions |
| --- |
| ***anr-InfoAvailable***  This field is used to indicate the availability of ANR measurement information. |
| ***measResultServCell***  This field refers to the last idle mode measurement results taken of the serving cell. |
| ***rlf-InfoAvailable***  This field is used to indicate the availability of radio link failure related information. |
| ***selectedPLMN-Identity***  Index of the PLMN selected by the UE from the *plmn-IdentityList* included in *SystemInformationBlockType1-NB*. 1 if the 1st PLMN is selected from the *plmn-IdentityList* included in SIB1-NB, 2 if the 2nd PLMN is selected from the *plmn-IdentityList* included in SIB1-NB and so on. |

#### – *RRCConnectionResumeRequest-NB*

The *RRCConnectionResumeRequest-NB* message is used to request the resumption of a suspended RRC connection or to perform UP-EDT.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E‑UTRAN

*RRCConnectionResumeRequest-NB* message

-- ASN1START

RRCConnectionResumeRequest-NB ::= SEQUENCE {

criticalExtensions CHOICE {

rrcConnectionResumeRequest-r13 RRCConnectionResumeRequest-NB-r13-IEs,

later CHOICE {

rrcConnectionResumeRequest-r16 RRCConnectionResumeRequest-5GC-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

}

RRCConnectionResumeRequest-NB-r13-IEs ::= SEQUENCE {

resumeID-r13 ResumeIdentity-r13,

shortResumeMAC-I-r13 ShortMAC-I,

resumeCause-r13 EstablishmentCause-NB-r13,

earlyContentionResolution-r14 BOOLEAN,

cqi-NPDCCH-r14 CQI-NPDCCH-NB-r14,

anr-InfoAvailable-r16 BOOLEAN,

spare BIT STRING (SIZE (3))

}

RRCConnectionResumeRequest-5GC-NB-r16-IEs ::= SEQUENCE {

resumeID-r16 I-RNTI-r15,

shortResumeMAC-I-r16 ShortMAC-I,

resumeCause-r16 EstablishmentCause-NB-r13,

cqi-NPDCCH-r16 CQI-NPDCCH-NB-r14,

spare BIT STRING (SIZE (4))

}

-- ASN1STOP

| *RRCConnectionResumeRequest-NB* field descriptions |
| --- |
| ***anr-InfoAvailable***  This field is used to indicate the availability of ANR measurement information when the UE is perfoming UP-EDT. |
| ***earlyContentionResolution***  Value TRUE indicates UE supports MAC PDU containing the UE contention resolution identity MAC control element without RRC response message. This field is always set to TRUE in this version of the specification. |
| ***resumeCause***  Provides the resume cause for the RRC connection resume request as provided by the upper layers.  eNB is not expected to reject a *RRCConnectionResumeRequest* due to unknown cause value being used by the UE. |
| ***resumeID***  UE identity to facilitate UE context retrieval at eNB. |
| ***shortResumeMAC-I***  Authentication token to facilitate UE authentication at eNB. |

#### – *RRCConnectionSetup-NB*

The *RRCConnectionSetup-NB* message is used to establish SRB1 and SRB1bis.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E‑UTRAN to UE

*RRCConnectionSetup-NB* message

-- ASN1START

RRCConnectionSetup-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE {

rrcConnectionSetup-r13 RRCConnectionSetup-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionSetup-NB-r13-IEs ::= SEQUENCE {

radioResourceConfigDedicated-r13 RadioResourceConfigDedicated-NB-r13,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionSetup-NB-v16xy-IEs OPTIONAL

}

RRCConnectionSetup-NB-v16xy-IEs ::= SEQUENCE {

dedicatedInfoNAS-r16 DedicatedInfoNAS OPTIONAL, -- Need ON

newUE-Identity-r16 C-RNTI OPTIONAL, -- Need OP

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionSetup-NB* field descriptions |
| --- |
| ***dedicatedInfoNAS***  Downlink NAS PDU in case of mobile terminated CP-EDT. E-UTRAN may include this field only if the *RRCConnectionSetup* is in response to *RRCEarlyDataRequest* with establishment cause *mt-Access*. |
| ***newUE-Identity***  C-RNTI used in RRC connection, see TS 36.321 [6]. |

#### – *RRCConnectionSetupComplete-NB*

The *RRCConnectionSetupComplete-NB* message is used to confirm the successful completion of an RRC connection establishment.

Signalling radio bearer: SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*RRCConnectionSetupComplete-NB* message

-- ASN1START

RRCConnectionSetupComplete-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE{

rrcConnectionSetupComplete-r13 RRCConnectionSetupComplete-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCConnectionSetupComplete-NB-r13-IEs ::= SEQUENCE {

selectedPLMN-Identity-r13 INTEGER (1..maxPLMN-r11),

s-TMSI-r13 S-TMSI OPTIONAL,

registeredMME-r13 RegisteredMME OPTIONAL,

dedicatedInfoNAS-r13 DedicatedInfoNAS,

attachWithoutPDN-Connectivity-r13 ENUMERATED {true} OPTIONAL,

up-CIoT-EPS-Optimisation-r13 ENUMERATED {true} OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCConnectionSetupComplete-NB-v1430-IEs OPTIONAL

}

RRCConnectionSetupComplete-NB-v1430-IEs ::= SEQUENCE {

gummei-Type-r14 ENUMERATED { mapped} OPTIONAL,

dcn-ID-r14 INTEGER (0..65535) OPTIONAL,

nonCriticalExtension RRCConnectionSetupComplete-NB-v1470-IEs OPTIONAL

}

RRCConnectionSetupComplete-NB-v1470-IEs ::= SEQUENCE {

measResultServCell-r14 MeasResultServCell-NB-r14 OPTIONAL,

nonCriticalExtension RRCConnectionSetupComplete-NB-v16xy-IEs OPTIONAL

}

RRCConnectionSetupComplete-NB-v16xy-IEs ::= SEQUENCE {

ng-5G-S-TMSI-r16 NG-5G-S-TMSI-r15 OPTIONAL,

registeredAMF-r16 RegisteredAMF-r15 OPTIONAL,

gummei-Type-v16xy ENUMERATED {mappedFrom5G} OPTIONAL,

guami-Type-r16 ENUMERATED {native, mapped} OPTIONAL,

s-NSSAI-list-r16 SEQUENCE(SIZE (1..maxNrofS-NSSAI-r15)) OF

S-NSSAI-r15 OPTIONAL,

ng-U-DataTransfer-r16 ENUMERATED {true} OPTIONAL,

up-CIoT-5GS-Optimisation-r16 ENUMERATED {true} OPTIONAL,

rlf-InfoAvailable-r16 ENUMERATED {true} OPTIONAL,

anr-InfoAvailable-r16 ENUMERATED {true} OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCConnectionSetupComplete-NB* field descriptions |
| --- |
| ***anr-InfoAvailable***  This field is used to indicate the availability of ANR measurement information. |
| ***attachWithoutPDN-Connectivity***  This field is used to indicate that the UE performs an Attach without PDN connectivity procedure, as indicated by the upper layers, TS 24.301 [35]. |
| ***dcn-ID***  The Dedicated Core Network Identity, see TS 23.401 [41]. |
| ***guami-Type***  This field is used to indicate whether the GUAMI included is native (derived from native 5G-GUTI) or mapped (from EPS, derived from EPS GUTI) as specified in TS 24.501 [95]. |
| ***gummei-Type***  This field is used to indicate that the GUMMEI included is mapped (from 2G/3G identifiers or 5G identifiers) as indicated by the upper layers, TS 24.301 [35] and TS 24.501 [95]. The value *mapped* indicates the GUMMEI is mapped from 2G/3G identifiers, and *mappedFrom5G* indicates the GUMMEI is mapped from 5G identifiers. A UE shall not include both *gummei-Type-r14* and *gummei-Type-v16xy*. |
| ***measResultServCell***  This field refers to the last idle mode measurement results taken of the serving cell. |
| ***ng-U-DataTransfer***  This field is included when the UE supports NG-U data transfer, as indicated by the upper layers, see TS 24.501 [95]. |
| ***registeredAMF***  This field is used to transfer the GUAMI of the AMF where the UE is registered, as provided by upper layers, see TS 23.003 [27]. |
| ***registeredMME***  This field is used to transfer the GUMMEI of the MME where the UE is registered, as provided by upper layers. |
| ***rlf-InfoAvailable***  This field is used to indicate the availability of radio link failure related information. |
| ***selectedPLMN-Identity***  Index of the PLMN selected by the UE from the *plmn-IdentityList* included in *SystemInformationBlockType1-NB*. 1 if the 1st PLMN is selected from the *plmn-IdentityList* included in SIB1, 2 if the 2nd PLMN is selected from the *plmn-IdentityList* included in SIB1 and so on. |
| ***s-NSSAI-List***  This field is a list of S-NSSAI as indicated by the upper layers. The UE can report up to eight S-NSSAI per NSSAI, see TS 23.003 [27]. |
| ***up-CIoT-5GS-Optimisation***  This field is included when the UE supports User plane CIoT 5GS Optimisation, as indicated by the upper layers, see TS 24.501 [95]. |
| ***up-CIoT-EPS-Optimisation***  This field is included when the UE supports S1-U data transfer or the User plane CIoT EPS Optimisation, as indicated by the upper layers, see TS 24.301 [35]. |

#### – *RRCEarlyDataComplete-NB*

The *RRCEarlyDataComplete-NB* message is used to confirm the successful completion of the CP-EDT procedure.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E‑UTRAN to UE

*RRCEarlyDataComplete-NB* message

-- ASN1START

RRCEarlyDataComplete-NB-r15 ::= SEQUENCE {

criticalExtensions CHOICE {

rrcEarlyDataComplete-r15 RRCEarlyDataComplete-NB-r15-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCEarlyDataComplete-NB-r15-IEs ::= SEQUENCE {

dedicatedInfoNAS-r15 DedicatedInfoNAS OPTIONAL, -- Need ON

extendedWaitTime-r15 INTEGER (1..1800) OPTIONAL, -- Need ON

redirectedCarrierInfo-r15 RedirectedCarrierInfo-NB-r13 OPTIONAL, -- Need ON

redirectedCarrierInfoExt-r15 RedirectedCarrierInfo-NB-v1430 OPTIONAL, -- Cond Redirection

nonCriticalExtension RRCEarlyDataComplete-NB-v1590-IEs OPTIONAL

}

RRCEarlyDataComplete-NB-v1590-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCEarlyDataComplete-NB* field descriptions |
| --- |
| ***extendedWaitTime***  Value in seconds. |

| Conditional presence | Explanation |
| --- | --- |
| *Redirection* | The field is optionally present, Need ON, if *redirectedCarrierInfo* is included; otherwise the field is not present. |

#### – *RRCEarlyDataRequest-NB*

The *RRCEarlyDataRequest-NB* message is used to initiate CP-EDT.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E‑UTRAN

*RRCEarlyDataRequest-NB* message

-- ASN1START

RRCEarlyDataRequest-NB-r15 ::= SEQUENCE {

criticalExtensions CHOICE {

rrcEarlyDataRequest-r15 RRCEarlyDataRequest-NB-r15-IEs,

later CHOICE {

rrcEarlyDataRequest-r16 RRCEarlyDataRequest-5GC-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

}

RRCEarlyDataRequest-NB-r15-IEs ::= SEQUENCE {

s-TMSI-r15 S-TMSI,

establishmentCause-r15 ENUMERATED {mo-Data, mo-ExceptionData, delayTolerantAccess, mt-Access-v16xy},

cqi-NPDCCH-r15 CQI-NPDCCH-NB-r14 OPTIONAL,

dedicatedInfoNAS-r15 DedicatedInfoNAS,

nonCriticalExtension RRCEarlyDataRequest-NB-v1590-IEs OPTIONAL

}

RRCEarlyDataRequest-NB-v1590-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

RRCEarlyDataRequest-5GC-NB-r16-IEs ::= SEQUENCE {

ng-5G-S-TMSI-r16 NG-5G-S-TMSI-r15,

establishmentCause-r16 ENUMERATED {mo-Data, mo-ExceptionData, mt-Access, spare1},

cqi-NPDCCH-r16 CQI-NPDCCH-NB-r14 OPTIONAL,

dedicatedInfoNAS-r16 DedicatedInfoNAS,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *RRCEarlyDataRequest-NB* field descriptions |
| --- |
| ***establishmentCause***  Provides the establishment cause for the RRC early data request as provided by the upper layers.  eNB is not expected to reject a *RRCEarlyDataRequest* due to unknown cause value being used by the UE. |

#### – *SCPTMConfiguration-NB*

The *SCPTMConfiguration-NB* message contains the control information applicable for MBMS services transmitted via SC-MRB.

Signalling radio bearer: N/A

RLC-SAP: UM

Logical channel: SC-MCCH

Direction: E‑UTRAN to UE

*SCPTMConfiguration-NB message*

-- ASN1START

SCPTMConfiguration-NB-r14 ::= SEQUENCE {

sc-mtch-InfoList-r14 SC-MTCH-InfoList-NB-r14,

scptm-NeighbourCellList-r14 SCPTM-NeighbourCellList-NB-r14 OPTIONAL, -- Need OP

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SCPTMConfiguration-NB-v16xy OPTIONAL

}

SCPTMConfiguration-NB-v16xy ::= SEQUENCE {

sc-mtch-InfoListMultiTB-r16 SC-MTCH-InfoList-NB-r14,

multiTB-Gap-r16 ENUMERATED {sf16, sf32, sf64, sf128} OPTIONAL, -- Need OR

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| ***SCPTMConfiguration-NB* field descriptions** |
| --- |
| ***multiTB-Gap***  Indicates the scheduling gap for SC-MTCH using multiple TB scheduling, see TS 36.211 [21] and TS 36.213 [23]. Value *sf16* corresponds to 16 subframes, *sf32* corresponds to 32 subframes, and so on. If the field is absent, there is no scheduling gap. |
| ***sc-mtch-InfoList***  Provides the configuration of each SC-MTCH not using multiple TB scheduling in the current cell. |
| ***sc-mtch-InfoListMultiTB***  Provides the configuration of each SC-MTCH using multiple TB scheduling in the current cell.  The total number of signalled SC-MTCH configuration in *sc-mtch-InfoList* and *sc-mtch-InfoListMultiTB* cannot be more than *maxSC-MTCH-NB-r14*. |
| ***scptm-NeighbourCellList***  List of neighbour cells providing MBMS services via SC-MRB. When absent, the UE shall assume that MBMS services listed in the *SCPTMConfiguration-NB* message are not provided via SC-MRB in any neighbour cell. |

#### – *SystemInformation-NB*

The *SystemInformation-NB* message is used to convey one or more System Information Blocks. All the SIBs included are transmitted with the same periodicity.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E‑UTRAN to UE

*SystemInformation-NB* message

-- ASN1START

SystemInformation-NB ::= SEQUENCE {

criticalExtensions CHOICE {

systemInformation-r13 SystemInformation-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

SystemInformation-NB-r13-IEs ::= SEQUENCE {

sib-TypeAndInfo-r13 SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {

sib2-r13 SystemInformationBlockType2-NB-r13,

sib3-r13 SystemInformationBlockType3-NB-r13,

sib4-r13 SystemInformationBlockType4-NB-r13,

sib5-r13 SystemInformationBlockType5-NB-r13,

sib14-r13 SystemInformationBlockType14-NB-r13,

sib16-r13 SystemInformationBlockType16-NB-r13,

...,

sib15-v1430 SystemInformationBlockType15-NB-r14,

sib20-v1430 SystemInformationBlockType20-NB-r14,

sib22-v1430 SystemInformationBlockType22-NB-r14,

sib23-v1530 SystemInformationBlockType23-NB-r15,

sib27-v16xy SystemInformationBlockType27-NB-r16

},

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

#### – *SystemInformationBlockType1-NB*

The *SystemInformationBlockType1-NB* messagecontains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E‑UTRAN to UE

*SystemInformationBlockType1-NB* message

-- ASN1START

SystemInformationBlockType1-NB ::= SEQUENCE {

hyperSFN-MSB-r13 BIT STRING (SIZE (8)),

cellAccessRelatedInfo-r13 SEQUENCE {

plmn-IdentityList-r13 PLMN-IdentityList-NB-r13,

trackingAreaCode-r13 TrackingAreaCode,

cellIdentity-r13 CellIdentity,

cellBarred-r13 ENUMERATED {barred, notBarred},

intraFreqReselection-r13 ENUMERATED {allowed, notAllowed}

},

cellSelectionInfo-r13 SEQUENCE {

q-RxLevMin-r13 Q-RxLevMin,

q-QualMin-r13 Q-QualMin-r9

},

p-Max-r13 P-Max OPTIONAL, -- Need OP

freqBandIndicator-r13 FreqBandIndicator-NB-r13,

freqBandInfo-r13 NS-PmaxList-NB-r13 OPTIONAL, -- Need OR

multiBandInfoList-r13 MultiBandInfoList-NB-r13 OPTIONAL, -- Need OR

downlinkBitmap-r13 DL-Bitmap-NB-r13 OPTIONAL, -- Cond SIB1

eutraControlRegionSize-r13 ENUMERATED {n1, n2, n3} OPTIONAL, -- Cond inband

nrs-CRS-PowerOffset-r13 ENUMERATED {dB-6, dB-4dot77, dB-3,

dB-1dot77, dB0, dB1,

dB1dot23, dB2, dB3,

dB4, dB4dot23, dB5,

dB6, dB7, dB8,

dB9} OPTIONAL, -- Cond inband-SamePCI

schedulingInfoList-r13 SchedulingInfoList-NB-r13,

si-WindowLength-r13 ENUMERATED {ms160, ms320, ms480, ms640,

ms960, ms1280, ms1600, spare1},

si-RadioFrameOffset-r13 INTEGER (1..15) OPTIONAL, -- Need OP

systemInfoValueTagList-r13 SystemInfoValueTagList-NB-r13 OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SystemInformationBlockType1-NB-v1350 OPTIONAL

}

SystemInformationBlockType1-NB-v1350 ::= SEQUENCE {

cellSelectionInfo-v1350 CellSelectionInfo-NB-v1350 OPTIONAL, -- Cond Qrxlevmin

nonCriticalExtension SystemInformationBlockType1-NB-v1430 OPTIONAL

}

SystemInformationBlockType1-NB-v1430 ::= SEQUENCE {

cellSelectionInfo-v1430 CellSelectionInfo-NB-v1430 OPTIONAL, -- Need OR

nonCriticalExtension SystemInformationBlockType1-NB-v1450 OPTIONAL

}

SystemInformationBlockType1-NB-v1450 ::= SEQUENCE {

nrs-CRS-PowerOffset-v1450 ENUMERATED {dB-6, dB-4dot77, dB-3,

dB-1dot77, dB0, dB1,

dB1dot23, dB2, dB3,

dB4, dB4dot23, dB5,

dB6, dB7, dB8,

dB9} OPTIONAL, -- Cond inband-SamePCI-ExceptAnchor

nonCriticalExtension SystemInformationBlockType1-NB-v1530 OPTIONAL

}

SystemInformationBlockType1-NB-v1530 ::= SEQUENCE {

tdd-Parameters-r15 SEQUENCE {

tdd-Config-r15 TDD-Config-NB-r15,

tdd-SI-CarrierInfo-r15 ENUMERATED {anchor, non-anchor},

tdd-SI-SubframesBitmap-r15 DL-Bitmap-NB-r13 OPTIONAL -- Cond TDD-SI-NonAnchor

} OPTIONAL, -- Cond TDD

schedulingInfoList-v1530 SchedulingInfoList-NB-v1530 OPTIONAL, -- Need OR

nonCriticalExtension SystemInformationBlockType1-NB-v16xy OPTIONAL

}

SystemInformationBlockType1-NB-v16xy ::= SEQUENCE {

cellAccessRelatedInfo-5GC-r16 SEQUENCE {

plmn-IdentityList-r16 PLMN-IdentityList-5GC-NB-r16,

trackingAreaCode-5GC-r16 TrackingAreaCode-5GC-r15,

cellIdentity-r16 CellIdentity OPTIONAL, -- Need OP

cellBarred-5GC-r16 ENUMERATED {barred, notBarred}

} OPTIONAL, -- Need OR

nonCriticalExtension SEQUENCE {} OPTIONAL

}

PLMN-IdentityList-NB-r13 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo-NB-r13

PLMN-IdentityList-5GC-NB-r16 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo-5GC-NB-r16

PLMN-IdentityInfo-NB-r13 ::= SEQUENCE {

plmn-Identity-r13 PLMN-Identity,

cellReservedForOperatorUse-r13 ENUMERATED {reserved, notReserved},

attachWithoutPDN-Connectivity-r13 ENUMERATED {true} OPTIONAL -- Need OP

}

PLMN-IdentityInfo-5GC-NB-r16 ::= SEQUENCE {

plmn-Identity-5GC-r16 CHOICE {

plmn-Identity-r16 PLMN-Identity,

plmn-Index-r16 INTEGER (1..maxPLMN-r11)

},

cellReservedForOperatorUse-r16 ENUMERATED {reserved, notReserved},

ng-U-DataTransfer-r16 ENUMERATED {true} OPTIONAL, -- Need OR

up-CIoT-5GS-Optimisation-r16 ENUMERATED {true} OPTIONAL -- Need OR

}

SchedulingInfoList-NB-r13 ::= SEQUENCE (SIZE (1..maxSI-Message-NB-r13)) OF SchedulingInfo-NB-r13

SchedulingInfoList-NB-v1530 ::= SEQUENCE (SIZE (1..maxSI-Message-NB-r13)) OF SchedulingInfo-NB-v1530

SchedulingInfo-NB-r13::= SEQUENCE {

si-Periodicity-r13 ENUMERATED {rf64, rf128, rf256, rf512,

rf1024, rf2048, rf4096, spare},

si-RepetitionPattern-r13 ENUMERATED {every2ndRF, every4thRF, every8thRF, every16thRF},

sib-MappingInfo-r13 SIB-MappingInfo-NB-r13,

si-TB-r13 ENUMERATED {b56, b120, b208, b256, b328, b440, b552, b680}

}

SchedulingInfo-NB-v1530::= SEQUENCE {

sib-MappingInfo-v1530 SIB-MappingInfo-NB-v1530 OPTIONAL -- Need OR

}

SystemInfoValueTagList-NB-r13 ::= SEQUENCE (SIZE (1.. maxSI-Message-NB-r13)) OF

SystemInfoValueTagSI-r13

SIB-MappingInfo-NB-r13 ::= SEQUENCE (SIZE (0..maxSIB-1)) OF SIB-Type-NB-r13

SIB-MappingInfo-NB-v1530 ::= SEQUENCE (SIZE (1..8)) OF SIB-Type-NB-v1530

SIB-Type-NB-r13 ::= ENUMERATED {

sibType3-NB-r13, sibType4-NB-r13, sibType5-NB-r13,

sibType14-NB-r13, sibType16-NB-r13, sibType15-NB-r14,

sibType20-NB-r14, sibType22-NB-r14}

SIB-Type-NB-v1530 ::= ENUMERATED {

sibType23-NB-r15, sibType27-NB-r16, spare6, spare5,

spare4, spare3, spare2, spare1}

CellSelectionInfo-NB-v1350 ::= SEQUENCE {

delta-RxLevMin-v1350 INTEGER (-8..-1)

}

CellSelectionInfo-NB-v1430 ::= SEQUENCE {

powerClass14dBm-Offset-r14 ENUMERATED {dB-6, dB-3, dB3, dB6, dB9, dB12} OPTIONAL, -- Need OP

ce-authorisationOffset-r14 ENUMERATED {dB5, dB10, dB15, dB20, dB25, dB30, dB35} OPTIONAL -- Need OP

}

-- ASN1STOP

| *SystemInformationBlockType1-NB* field descriptions |
| --- |
| ***attachWithoutPDN-Connectivity***  If present, the field indicates that attach without PDN connectivity as specified in TS 24.301 [35] is supported for this PLMN. |
| ***ce-authorisationOffset***  Parameter "Qoffsetauthorization" in TS 36.304 [4]. Value in dB. Value dB5 corresponds to 5 dB, dB10 corresponds to 10 dB and so on.  If the field is absent, the value of 0 dB shall be used for "Qoffsetauthorization". |
| ***cellBarred***  Barred means the cell is barred for connectivity to EPC, as defined in TS 36.304 [4]. |
| ***cellBarred-5GC***  Barred means the cell is barred for connectivity to 5GC, as defined in TS 36.304 [4]. |
| ***cellIdentity***  Indicates the cell identity.  If the field is absent in *cellAccessRelatedInfo-5GC*, the cell identity indicated by the *cellIdentity* field included in *cellAccessRelatedInfo* for EPC is used when connected to 5GC. |
| ***cellReservedForOperatorUse***  As defined in TS 36.304 [4]. |
| ***cellSelectionInfo***  Cell selection information as specified in TS 36.304 [4]. |
| ***downlinkBitmap***  For FDD, NB-IoT downlink subframe configuration for downlink transmission as specified in TS 36.213 [23], clause 16.4.  For TDD, NB-IoT downlink, uplink and special subframes configuration for transmission on the anchor carrier as specified in TS 36.213 [23], clause 16.4. If the bitmap is not present, the UE shall assume that all subframes are valid (except for subframes carrying NPSS/NSSS/NPBCH/SIB1-NB) as specified in TS 36.213 [23], clause 16.4. |
| ***eutraControlRegionSize***  Indicates the control region size of the E-UTRA cell for the in-band operation mode, see TS 36.213 [23]. Unit is in number of OFDM symbols. |
| ***freqBandInfo***  A list of *additionalPmax* and *additionalSpectrumEmission* values as defined in TS 36.101 [42], clause 6.2.4F for the frequency band in *freqBandIndicator*. |
| ***hyperSFN-MSB***  Indicates the 8 most significant bits of hyper-SFN. Together with hyperSFN-LSB in MIB-NB, the complete hyper-SFN is built up. hyper-SFN is incremented by one when the SFN wraps around. |
| ***intraFreqReselection***  Used to control cell reselection to intra-frequency cells when the highest ranked cell is barred, or treated as barred by the UE, as specified in TS 36.304 [4]. |
| ***multiBandInfoList***  A list of additional frequency band indicators, *additionalPmax* and *additionalSpectrumEmission* values, as defined in TS 36.101 [42], table 5.5-1. If the UE supports the frequency band in the *freqBandIndicator* IE it shall apply that frequency band. Otherwise, the UE shall apply the first listed band which it supports in the *multiBandInfoList* IE. |
| ***ng-U-DataTransfer***  If present, the field indicates that the NG-U data transfer as specified in TS 24.501 [95] is supported. |
| ***nrs-CRS-PowerOffset***  NRS power offset between NRS and E-UTRA CRS, see TS 36.213 [23], clause 16.2.2. Unit in dB. Default value of 0. |
| ***plmn-IdentityList***  List of PLMN identities. The first listed *PLMN-Identity* is the primary PLMN. |
| ***plmn-Index***  Index of the PLMN in the *plmn-IdentityList* field included in *cellAccessRelatedInfo* for EPC, indicating the same PLMN ID is used when connected to 5GC. |
| ***powerClass14dBm-Offset***  Parameter "Poffset" in TS 36.304 [4]. Only applicable for UE supporting *powerClassNB-14dBm*. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the fied is absent, the UE applies the (default) value of 0 dB for "Poffset" in TS 36.304 [4]. |
| ***p-Max***  Value applicable for the cell. If absent the UE applies the maximum power according to the UE capability. |
| ***q-QualMin***  Parameter "Qqualmin" in TS 36.304 [4]. |
| ***q-RxLevMin, delta-RxLevMin***  Parameter Qrxlevmin in TS 36.304 [4]. If *delta-RxLevMin* is not included, actual value Qrxlevmin = *q-RxLevMin* \* 2 [dBm]. If *delta-RxLevMin* is included, actual value Qrxlevmin = (*q-RxLevMin* + *delta-RxLevMin*) \* 2 [dBm]. |
| ***schedulingInfoList***  Indicates additional scheduling information of SI messages. |
| ***si-Periodicity***  Periodicity of the SI-message in radio frames, such that rf256 denotes 256 radio frames, rf512 denotes 512 radio frames, and so on. |
| ***si-RadioFrameOffset***  Offset in number of radio frames to calculate the start of the SI window.  If the field is absent, no offset is applied. |
| ***si-RepetitionPattern***  Indicates the starting radio frames within the SI window used for SI message transmission. Value every2ndRF corresponds to every 2 radio frames, value every4thRF corresponds to every 4 radio frames and so on. The first transmission of the SI message is transmitted from the first radio frame of the SI window. |
| ***si-TB***  This field indicates the transport block size in number of bits and the corresponding number of consecutive NB-IoT downlink subframes that are used to broadcast the SI message. Value b56 corresponds to 56 bits, b120 corresponds to 120 bits and so on. TBS of 56 bits and 120 bits are transmitted over 2 sub-frames, other TBS are transmitted over 8 sub-frames, see TS 36.213 [23], Table 16.4.1.5.1-1. |
| ***si-WindowLength***  Common SI scheduling window for all SIs. Unit in milliseconds, where ms160 denotes 160 milliseconds, ms320 denotes 320 milliseconds and so on. |
| ***sib-MappingInfo***  List of the SIBs mapped to this *SystemInformation* message. There is no mapping information of SIB2-NB; it is always present in the first *SystemInformation* message listed in the *schedulingInfoList* list. |
| ***systemInfoValueTagList***  Indicates SI message specific value tags. It includes the same number of entries, and listed in the same order, as in SchedulingInfoList. |
| ***systemInfoValueTagSI***  SI message specific value tag as specified in Clause 5.2.1.3. Common for all SIBs within the SI message other than SIB14-NB. |
| ***tdd-Config***  Indicates the the TDD specific physical channel configuration. |
| ***tdd-SI-CarrierInfo***  Carrier used for SI message transmission. Value *anchor* corresponds to anchor carrier, value *non-anchor* corresponds to non-anchor carrier. See TS 36.213 [23].  When *tdd-SI-CarrierInfo* set to value *non-anchor* then *sib-GuardbandInfo* in MIB-TDD-NB (in case of *operationmodeInfo* is set to *guardband*) or *sib-InbandLocation* in MIB-TDD-NB (in case of *operationmodeInfo* is set to *inband-SamePCI* or *inband-DifferentPCI*) or *sib-StandaloneLocation* in MIB-TDD-NB (in case of *operationmodeInfo* is set to *standalone)* defines which non-anchor carrier is used (see MIB-NB-TDD). |
| ***tdd-SI-SubframesBitmap***  NB-IoT downlink, uplink and special subframes configuration for transmission on the carrier carrying the SI message as specified in TS 36.213 [23], clause 16.4. |
| ***trackingAreaCode, trackingAreaCode-5GC***  A *trackingAreaCode* that is common for all the PLMNs listed. |
| ***up-CIoT-5GS-Optimisation***  This field indicates if the UE is allowed to resume the connection with User plane CIoT 5GS Optimisation, see TS24.501 [95]. |

| Conditional presence | Explanation |
| --- | --- |
| *inband* | In FDD: The field is mandatory present if IE *operationModeInfo* in MIB-NB is set to *inband-SamePCI* or *inband-DifferentPCI*. Otherwise the field is not present.  In TDD: The field is mandatory present if:  - IE *operationModeInfo* in MIB-TDD-NB is set to *inband-SamePCI* or *inband-DifferentPCI* or  - IE *operationModeInfo* in MIB-TDD-NB is set to *guardband* and IE *sib-GuardbandInfo* in MIB-TDD-NB is set to *sib-GuardbandInbandSamePCI* or *sib-GuardbandinbandDiffPCI* and IE *tdd-SI-CarrierInfo* is set to non-anchor |
| *inband-SamePCI* | The field is mandatory present, if IE *operationModeInfo* in MIB-NB is set *to inband-SamePCI.* Otherwise the field is not present. |
| *inband-SamePCI-ExceptAnchor* | The field is optionally present if IE *operationModeInfo* in MIB-NB is set toavalue other than *inband-SamePCI*, and at least one non-anchor carrier is inband carrier and uses the same PCI as the E-UTRA carrier*.* Otherwise the field is not present. |
| *Qrxlevmin* | This field is optionally present, Need OR, if *q-RxLevMin* is set to the minimum value. Otherwise the field is not present. |
| *SIB1* | The field is mandatory present if IE *additionalTransmissionSIB1* in MIB-NB is set to *TRUE*. Otherwise the field is optionally present, Need OP. |
| *TDD* | The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *TDD-SI-NonAnchor* | The field is mandatory present for TDD if *si-CarrierInfo* is set to *non-anchor*; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *UECapabilityEnquiry-NB*

The *UECapabilityEnquiry-NB* message is used to request the transfer of UE radio access capabilities for NB-IoT.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*UECapabilityEnquiry-NB* message

-- ASN1START

UECapabilityEnquiry-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

c1 CHOICE {

ueCapabilityEnquiry-r13 UECapabilityEnquiry-NB-r13-IEs,

spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UECapabilityEnquiry-NB-r13-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

#### – *UECapabilityInformation-NB*

The *UECapabilityInformation-NB* message is used to transfer of UE radio access capabilities requested by the E‑UTRAN.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*UECapabilityInformation-NB* message

-- ASN1START

UECapabilityInformation-NB ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE{

ueCapabilityInformation-r13 UECapabilityInformation-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

UECapabilityInformation-NB-r13-IEs ::= SEQUENCE {

ue-Capability-r13 UE-Capability-NB-r13,

ue-RadioPagingInfo-r13 UE-RadioPagingInfo-NB-r13,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension UECapabilityInformation-NB-Ext-r14-IEs OPTIONAL

}

UECapabilityInformation-NB-Ext-r14-IEs ::= SEQUENCE {

ue-Capability-ContainerExt-r14 OCTET STRING (CONTAINING UE-Capability-NB-Ext-r14-IEs),

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UECapabilityInformation-NB* field descriptions |
| --- |
| ***ue-RadioPagingInfo***  This field contains UE capability information used for paging. |

#### – *UEInformationRequest-NB*

The *UEInformationRequest-NB* is the command used by E-UTRAN to retrieve information from the UE.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E‑UTRAN to UE

*UEInformationRequest-NB message*

-- ASN1START

UEInformationRequest-NB-r16 ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

ueInformationRequest-r16 UEInformationRequest-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

UEInformationRequest-NB-r16-IEs ::= SEQUENCE {

rach-ReportReq-r16 BOOLEAN,

rlf-ReportReq-r16 BOOLEAN,

anr-ReportReq-r16 BOOLEAN,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UEInformationRequest-NB* field descriptions |
| --- |
| ***anr-ReportReq***  This field is used to indicate whether the UE shall report, if available, ANR measurement results. |
| ***rach-ReportReq***  This field is used to indicate whether the UE shall report, if available, information about the random access procedure. |
| ***rlf-ReportReq***  This field is used to indicate whether the UE shall report, if available, information about radio link failure. |

#### – *UEInformationResponse-NB*

The *UEInformationResponse-NB* 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-NB message*

-- ASN1START

UEInformationResponse-NB-r16 ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

ueInformationResponse-r16 UEInformationResponse-NB-r16-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

UEInformationResponse-NB-r16-IEs ::= SEQUENCE {

rach-Report-r16 RACH-Report-NB-r16 OPTIONAL,

rlf-Report-r16 RLF-Report-NB-r16 OPTIONAL,

anr-MeasReport-r16 ANR-MeasReport-NB-r16 OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

RACH-Report-NB-r16 ::= SEQUENCE {

numberOfPreamblesSent-r16 INTEGER (1..64),

contentionDetected-r16 BOOLEAN,

initialNRSRP-Level-r16 INTEGER (0..2),

edt-Fallback-r16 BOOLEAN

}

RLF-Report-NB-r16 ::= SEQUENCE {

failedPCellId-r16 CellGlobalIdEUTRA,

reestablishmentCellId-r16 CellGlobalIdEUTRA OPTIONAL,

locationInfo-r16 LocationInfo-r10 OPTIONAL,

measResultLastServCell-r16 SEQUENCE {

nrsrpResult-r16 NRSRP-Range-NB-r14,

nrsrqResult-r16 NRSRQ-Range-NB-r14 OPTIONAL

},

timeSinceFailure-r16 TimeSinceFailure-r11 OPTIONAL

}

-- ASN1STOP

| *UEInformationResponse-NB* field descriptions |
| --- |
| ***anr-MeasReport***  This field indicates the ANR measurement information. |
| ***contentionDetected***  This field is used to indicate that contention was detected for at least one of the transmitted preambles, see TS 36.321 [6]. |
| ***edt-Fallback***  Value TRUE indicates that EDT fallback indication was received from the lower layers, see TS 36.321 [6]. |
| ***failedPCellId***  This field is used to indicate the PCell in which RLF is detected. |
| ***initialNRSRP-Level***  Indicates the NRSRP level of the NPRACH resource selected for the first preamble transmission. |
| ***measResultLastServCell***  This field refers to the last measurement results taken in the PCell, where radio link failure happened. |
| ***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]. |
| ***reestablishmentCellId***  This field is used to indicate the cell in which the re-establishment attempt was made after connection failure. |
| ***timeSinceFailure***  This field is used to indicate the time that elapsed since the connection failure. Value in seconds. The maximum value 172800 means 172800s or longer. |

#### – *ULInformationTransfer-NB*

The *ULInformationTransfer-NB* message is used for the uplink transfer of NAS information.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E‑UTRAN

*ULInformationTransfer-NB* message

-- ASN1START

ULInformationTransfer-NB ::= SEQUENCE {

criticalExtensions CHOICE {

ulInformationTransfer-r13 ULInformationTransfer-NB-r13-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

ULInformationTransfer-NB-r13-IEs ::= SEQUENCE {

dedicatedInfoNAS-r13 DedicatedInfoNAS,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

### 6.7.3 NB-IoT information elements

#### 6.7.3.1 NB-IoT System information blocks

#### – *SystemInformationBlockType2-NB*

The IE *SystemInformationBlockType2-NB* contains radio resource configuration information that is common for all UEs.

NOTE: UE timers and constants related to functionality for which parameters are provided in another SIB are included in the corresponding SIB.

*SystemInformationBlockType2-NB* information element

-- ASN1START

SystemInformationBlockType2-NB-r13 ::= SEQUENCE {

radioResourceConfigCommon-r13 RadioResourceConfigCommonSIB-NB-r13,

ue-TimersAndConstants-r13 UE-TimersAndConstants-NB-r13,

freqInfo-r13 SEQUENCE {

ul-CarrierFreq-r13 CarrierFreq-NB-r13 OPTIONAL, -- Need OP

additionalSpectrumEmission-r13 AdditionalSpectrumEmission

},

timeAlignmentTimerCommon-r13 TimeAlignmentTimer,

multiBandInfoList-r13 SEQUENCE (SIZE (1..maxMultiBands)) OF AdditionalSpectrumEmission OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[ cp-Reestablishment-r14 ENUMERATED {true} OPTIONAL -- Need OP

]],

[[ servingCellMeasInfo-r14 ENUMERATED {true} OPTIONAL, -- Need OR

cqi-Reporting-r14 ENUMERATED {true} OPTIONAL -- Need OR

]],

[[ enhancedPHR-r15 ENUMERATED {true} OPTIONAL, -- Need OR

freqInfo-v1530 SEQUENCE {

tdd-UL-DL-AlignmentOffset-r15 TDD-UL-DL-AlignmentOffset-NB-r15

} OPTIONAL, -- Cond TDD

cp-EDT-r15 ENUMERATED {true} OPTIONAL, -- Need OR

up-EDT-r15 ENUMERATED {true} OPTIONAL -- Need OR

]],

[[ earlySecurityReactivation-r16 ENUMERATED {true} OPTIONAL, -- Need OR

cp-EDT-5GC-r16 ENUMERATED {true} OPTIONAL, -- Need OR

up-EDT-5GC-r16 ENUMERATED {true} OPTIONAL, -- Need OR

cp-PUR-EPC-r16 ENUMERATED {true} OPTIONAL, -- Need OR

up-PUR-EPC-r16 ENUMERATED {true} OPTIONAL, -- Need OR

cp-PUR-5GC-r16 ENUMERATED {true} OPTIONAL, -- Need OR

up-PUR-5GC-r16 ENUMERATED {true} OPTIONAL, -- Need OR

rai-ActivationEnh-r16 ENUMERATED {true} OPTIONAL -- Need OR

]]

}

-- ASN1STOP

| *SystemInformationBlockType2-NB* field descriptions |
| --- |
| ***additionalSpectrumEmission***  The UE requirements related to IE *AdditionalSpectrumEmission* are defined in TS 36.101 [42], clause 6.2.4F. |
| ***cp-EDT***  For FDD: This field indicates whether the UE is allowed to initiate CP-EDT when connected to EPC, see 5.3.3.1b. |
| ***cp-EDT-5GC***  For FDD: This field indicates whether the UE is allowed to initiate CP-EDT when connected to 5GC, see 5.3.3.1b. |
| ***cp-PUR-5GC***  For FDD: This field indicates whether CP transmission using PUR is allowed in the cell when connected to 5GC, see 5.3.3.1c. |
| ***cp-PUR-EPC***  For FDD: This field indicates whether CP transmission using PUR is allowed in the cell when connected to EPC, see 5.3.3.1c. |
| ***cp-Reestablishment***  This field indicates if the NB-IoT UE is allowed to trigger RRC connection re-establishment when AS security has not been activated. |
| ***cqi-Reporting***  For FDD: This field indicates if downlink channel quality reporting in *RRCConnectionReestablishmentRequest-NB, RRCConnectionRequest-NB and RRCConnectionResumeRequest-NB message* is allowed. |
| ***earlySecurityReactivation***  If present, this field indicates that early security reactivation when resuming a suspended RRC connection as specified in 5.3.3.18 is supported. |
| ***enhancedPHR***  For FDD: This field indicates if the NB-IoT UE is allowed to report enhanced PHR in MSG3 as specified in TS 36.321 [6]. |
| ***multiBandInfoList***  A list of *additionalSpectrumEmission* i.e. one for each additional frequency band included in *multiBandInfoList* in *SystemInformationBlockType1-NB,* listed in the same order*.* |
| ***rai-ActivationEnh***  This field indicates whether the UE is allowed to report the AS Release Assistance Indication via the DCQR and AS RAI MAC CE as specified in TS 36.321 [6] when connected to EPC. |
| ***servingCellMeasInfo***  This field indicates if serving cell idle mode measurement reporting in *RRCConnectionReestablishmentComplete-NB*, *RRCConnectionResumeComplete-NB* and *RRCConnectionSetupComplete-NB* is allowed. |
| ***tdd-UL-DL-AlignmentOffset***  Indicates the offset between the UL carrier frequency center with respect to DL carrier frequency center for the anchor carrier. |
| ***ul-CarrierFreq***  For FDD: Uplink carrier frequency as defined in TS 36.101 [42], clause 5.7.3F. If *operationModeInfo* in the MIB-NB is set to *standalone* and the field is absent*,* thevalue of the carrier frequency is determined by the TX-RX frequency separation defined in TS 36.101 [42], table 5.7.4-1, and the value of the carrier frequency offset is 0. If *operationModeInfo* in the MIB-NB is not set to *standalone,* thefield is mandatory present.  For TDD: This field is absent and the uplink carrier frequency is same as the downlink frequency. |
| ***up-EDT***  For FDD: This field indicates whether the UE is allowed to initiate UP-EDT when connected to EPC, see 5.3.3.1b. |
| ***up-EDT-5GC***  For FDD: This field indicates whether the UE is allowed to initiate UP-EDT when connected to 5GC, see 5.3.3.1b. |
| ***up-PUR-5GC***  For FDD: This field indicates whether UP transmission using PUR is allowed in the cell when connected to 5GC, see 5.3.3.1c. |
| ***up-PUR-EPC***  For FDD: This field indicates whether UP transmission using PUR is allowed in the cell when connected to EPC, see 5.3.3.1c. |

| Conditional presence | Explanation |
| --- | --- |
| *TDD* | The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *SystemInformationBlockType3-NB*

The IE *SystemInformationBlockType3-NB* contains cell re-selection information common for intra-frequency, and inter-frequency cell re-selection as well as intra-frequency cell re-selection information other than neighbouring cell related.

*SystemInformationBlockType3-NB* information element

-- ASN1START

SystemInformationBlockType3-NB-r13 ::= SEQUENCE {

cellReselectionInfoCommon-r13 SEQUENCE {

q-Hyst-r13 ENUMERATED {

dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10,

dB12, dB14, dB16, dB18, dB20, dB22, dB24

}

},

cellReselectionServingFreqInfo-r13 SEQUENCE {

s-NonIntraSearch-r13 ReselectionThreshold

},

intraFreqCellReselectionInfo-r13 SEQUENCE {

q-RxLevMin-r13 Q-RxLevMin,

q-QualMin-r13 Q-QualMin-r9 OPTIONAL, -- Need OP

p-Max-r13 P-Max OPTIONAL, -- Need OP

s-IntraSearchP-r13 ReselectionThreshold,

t-Reselection-r13 T-Reselection-NB-r13

},

freqBandInfo-r13 NS-PmaxList-NB-r13 OPTIONAL, -- Need OR

multiBandInfoList-r13 SEQUENCE (SIZE (1..maxMultiBands)) OF

NS-PmaxList-NB-r13 OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[ intraFreqCellReselectionInfo-v1350 IntraFreqCellReselectionInfo-NB-v1350 OPTIONAL -- Cond Qrxlevmin

]],

[[ intraFreqCellReselectionInfo-v1360 IntraFreqCellReselectionInfo-NB-v1360 OPTIONAL -- Need OR

]],

[[ intraFreqCellReselectionInfo-v1430 IntraFreqCellReselectionInfo-NB-v1430 OPTIONAL -- Need OR

]],

[[ cellReselectionInfoCommon-v1450 CellReselectionInfoCommon-NB-v1450 OPTIONAL -- Need OR

]],

[[ nsss-RRM-Config-r15 NSSS-RRM-Config-NB-r15 OPTIONAL, -- Need OR

npbch-RRM-Config-r15 ENUMERATED {enabled} OPTIONAL -- Need OR

]]

}

IntraFreqCellReselectionInfo-NB-v1350 ::= SEQUENCE {

delta-RxLevMin-v1350 INTEGER (-8..-1)

}

IntraFreqCellReselectionInfo-NB-v1360 ::= SEQUENCE {

s-IntraSearchP-v1360 ReselectionThreshold-NB-v1360

}

IntraFreqCellReselectionInfo-NB-v1430 ::= SEQUENCE {

powerClass14dBm-Offset-r14 ENUMERATED {dB-6, dB-3, dB3, dB6, dB9, dB12} OPTIONAL, -- Need OP

ce-AuthorisationOffset-r14 ENUMERATED {dB5, dB10, dB15, dB20, dB25, dB30, dB35} OPTIONAL -- Need OP

}

CellReselectionInfoCommon-NB-v1450 ::= SEQUENCE {

s-SearchDeltaP-r14 ENUMERATED {dB6, dB9, dB12, dB15}

}

-- ASN1STOP

| *SystemInformationBlockType3-NB* field descriptions |
| --- |
| ***ce-AuthorisationOffset***  Parameter "Qoffsetauthorization" in TS 36.304 [4]. Value in dB. Value dB5 corresponds to 5 dB, dB10 corresponds to 10 dB and so on.  If the field is absent, the UE applies the value of ce-*authorisationOffset* in *SystemInformationBlockType1-NB*. |
| ***multiBandInfoList***  A list of *additionalPmax* and *additionalSpectrumEmission* values as defined in TS 36.101 [42], clause 6.2.4F, applicable for the intra-frequency neighbouring NB-IoT cells if the UE selects the frequency band from *freqBandIndicator* in *SystemInformationBlockType1-NB*. |
| ***npbch-RRM-Config***  For FDD: Configuration for NPBCH-based RRM measurements. See TS 36.214 [24].  If enabled, NPBCH can be used in addition to NRS for RRM measurements for serving cell. |
| ***nsss-RRM-Config***  For FDD: Configuration for NSSS-based RRM measurements for the serving cell. |
| ***powerClass14dBm-Offset***  Parameter "Poffset" in TS 36.304 [4], only applicable for UE supporting *powerClassNB-14dBm*. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the field is absent, the UE applies the (default) value of 0 dB for "Poffset" in TS 36.304 [4]. |
| ***p-Max***  Value applicable for the intra-frequency neighbouring E-UTRA cells. If absent the UE applies the maximum power according to the UE capability. |
| ***q-Hyst***  Parameter *Qhyst* in TS 36.304 [4], Value in dB. Value dB1 corresponds to 1 dB, dB2 corresponds to 2 dB and so on. |
| ***q-QualMin***  Parameter "Qqualmin" in TS 36.304 [4], applicable for intra-frequency neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin. |
| ***q-RxLevMin, delta-RxLevMin***  Parameter "Qrxlevmin" in TS 36.304 [4], applicable for intra-frequency neighbour cells. If *delta-RxLevMin* is not included, actual value Qrxlevmin = *q-RxLevMin* \* 2 [dBm]. If *delta-RxLevMin* is included, actual value Qrxlevmin = (*q-RxLevMin* + *delta-RxLevMin*) \* 2 [dBm]. |
| ***s-IntraSearchP***  Parameter "SIntraSearchP" in TS 36.304 [4].  In case *s-IntraSearchP-v1360* is included, the UE shall ignore *s-IntraSearchP* (i.e. without suffix). |
| ***s-NonIntraSearch***  Parameter "SnonIntraSearchP" in TS 36.304 [4]. |
| ***s-SearchDeltaP***  Parameter "SSearchDeltaP" in TS 36.304 [4]. This parameter is only applicable for UEs supporting relaxed monitoring as specified in TS 36.306 [5]. Value dB6 corresponds to 6 dB, dB9 corresponds to 9 dB and so on. |
| ***t-Reselection***  Parameter "TreselectionNB-IoT\_Intra" in TS 36.304 [4]. |

| Conditional presence | Explanation |
| --- | --- |
| Qrxlevmin | This field is optionally present, Need OR, if *q-RxLevMin* is set to the minimum value. Otherwise the field is not present. |

#### – *SystemInformationBlockType4-NB*

The IE *SystemInformationBlockType4-NB* contains neighbouring cell related information relevant only for intra-frequency cell re-selection. The IE includes cells with specific re-selection parameters.

*SystemInformationBlockType4-NB* information element

-- ASN1START

SystemInformationBlockType4-NB-r13 ::= SEQUENCE {

intraFreqNeighCellList-r13 IntraFreqNeighCellList OPTIONAL, -- Need OR

intraFreqBlackCellList-r13 IntraFreqBlackCellList OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[ nsss-RRM-Config-r15 NSSS-RRM-Config-NB-r15 OPTIONAL, -- Need OR

intraFreqNeighCellList-v1530 IntraFreqNeighCellList-NB-v1530 OPTIONAL -- Need OR

]]

}

IntraFreqNeighCellList-NB-v1530 ::= SEQUENCE (SIZE (1..maxCellIntra)) OF IntraFreqNeighCellInfo-NB-v1530

IntraFreqNeighCellInfo-NB-v1530 ::= SEQUENCE {

nsss-RRM-Config-r15 NSSS-RRM-Config-NB-r15 OPTIONAL -- Cond NSSS-RRM

}

-- ASN1STOP

| *SystemInformationBlockType4-NB* field descriptions |
| --- |
| ***intraFreqBlackCellList***  List of blacklisted intra-frequency neighbouring cells. |
| ***intraFreqNeighCellList***  List of intra-frequency neighbouring cells with specific cell re-selection parameters. |
| ***nsss-RRM-Config***  For FDD: Configuration for NSSS-based RRM measurements.  If *intraFreqNeighCellList-NB-v1530* is present then for a cell which is included in *intraFreqNeighCellList*, the UE applies the *nsss-RRM-Config* configured in the corresponding entry of *IntraFreqNeighCellList-NB-v1530*. Otherwise, the UE applies the *nsss-RRM-Config* configured in *SystemInformationBlockType4-NB-r13*. |

| Conditional presence | Explanation |
| --- | --- |
| *NSSS-RRM* | This field is optionally present, Need OR, when *nsss-RRM-Config* is present in *SystemInformationBlockType4-NB*. Otherwise, the field is not present, and the UE shall delete any existing value for this field. |

#### – *SystemInformationBlockType5-NB*

The IE *SystemInformationBlockType5-NB* contains information relevant only for inter-frequency cell re-selection i.e. information about other NB-IoT frequencies and inter-frequency neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

*SystemInformationBlockType5-NB* information element

-- ASN1START

SystemInformationBlockType5-NB-r13 ::= SEQUENCE {

interFreqCarrierFreqList-r13 InterFreqCarrierFreqList-NB-r13,

t-Reselection-r13 T-Reselection-NB-r13,

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[ scptm-FreqOffset-r14 INTEGER (1..8) OPTIONAL -- Need OP

]]

}

InterFreqCarrierFreqList-NB-r13 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-NB-r13

InterFreqCarrierFreqInfo-NB-r13 ::= SEQUENCE {

dl-CarrierFreq-r13 CarrierFreq-NB-r13,

q-RxLevMin-r13 Q-RxLevMin,

q-QualMin-r13 Q-QualMin-r9 OPTIONAL, -- Need OP

p-Max-r13 P-Max OPTIONAL, -- Need OP

q-OffsetFreq-r13 Q-OffsetRange DEFAULT dB0,

interFreqNeighCellList-r13 InterFreqNeighCellList-NB-r13 OPTIONAL, -- Need OR

interFreqBlackCellList-r13 InterFreqBlackCellList-NB-r13 OPTIONAL, -- Need OR

multiBandInfoList-r13 MultiBandInfoList-NB-r13 OPTIONAL, -- Need OR

...,

[[ delta-RxLevMin-v1350 INTEGER (-8..-1) OPTIONAL -- Cond Qrxlevmin

]],

[[ powerClass14dBm-Offset-r14 ENUMERATED {dB-6, dB-3, dB3, dB6, dB9, dB12}

OPTIONAL, -- Need OP

ce-AuthorisationOffset-r14 ENUMERATED {dB5, dB10, dB15, dB20, dB25, dB30, dB35} OPTIONAL -- Need OP

]],

[[ nsss-RRM-Config-r15 NSSS-RRM-Config-NB-r15 OPTIONAL, -- Need OR

interFreqNeighCellList-v1530 InterFreqNeighCellList-NB-v1530 OPTIONAL -- Need OR

]],

[[ dl-CarrierFreq-v1550 CarrierFreq-NB-v1550 OPTIONAL -- Cond TDD

]]

}

InterFreqNeighCellList-NB-r13 ::= SEQUENCE (SIZE (1..maxCellInter)) OF PhysCellId

InterFreqNeighCellList-NB-v1530 ::= SEQUENCE (SIZE (1..maxCellInter)) OF InterFreqNeighCellInfo-NB-v1530

InterFreqNeighCellInfo-NB-v1530 ::= SEQUENCE {

nsss-RRM-Config-r15 NSSS-RRM-Config-NB-r15 OPTIONAL -- Cond NSSS-RRM

}

InterFreqBlackCellList-NB-r13 ::= SEQUENCE (SIZE (1..maxCellBlack)) OF PhysCellId

-- ASN1STOP

| *SystemInformationBlockType5-NB* field descriptions |
| --- |
| ***ce-AuthorisationOffset***  Parameter "Qoffsetauthorization" in TS 36.304 [4]. Value in dB. Value dB5 corresponds to 5 dB, dB10 corresponds to 10 dB and so on. If the field is absent, the UE applies the value of ce-*authorisationOffset* in *SystemInformationBlockType1-NB*. |
| ***interFreqBlackCellList***  List of blacklisted inter-frequency neighbouring cells. |
| ***interFreqCarrierFreqList***  List of neighbouring inter-frequencies. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the E-ARFCN used to indicate this. |
| ***interFreqNeighCellList***  List of inter-frequency neighbouring cells. E-UTRAN may include *interFreqNeighCellList* when including *InterFreqNeighCellList-NB-v1530* to provide cell specific NSSS-based measurement configuration. The UE that does not support NSSS-based RRM measurements shall ignore this field in this version of the specification. |
| ***multiBandInfoList***  Indicates the list of frequency bands, with the associated *additionalPmax* and *additionalSpectrumEmission* values as defined in TS 36.101 [42], clause 6.2.4, in addition to the band represented by dl-CarrierFreq for which cell reselection parameters are common. |
| ***nsss-RRM-Config***  For FDD: Configuration for NSSS-based RRM measurements.  If *InterFreqNeighCellList-NB-v1530* is present then for a cell which is included in *interFreqNeighCellList*, the UE applies the *nsss-RRM-Config* configured in the corresponding entry of *InterFreqNeighCellList-NB-v1530*. Otherwise, the UE applies the *nsss-RRM-Config* configured in *InterFreqCarrierFreqInfo*. |
| ***p-Max***  Value applicable for the neighbouring NB-IoT cells on this carrier frequency. If absent the UE applies the maximum power according to the UE capability. |
| ***powerClass14dBm-Offset***  Parameter "Poffset" in TS 36.304 [4], only applicable for UE supporting *powerClassNB-14dBm*. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the field is absent, the UE applies the (default) value of 0 dB for "Poffset" in TS 36.304 [4] |
| ***q-OffsetFreq***  Parameter "Qoffsetfrequency" in TS 36.304 [4]. |
| ***q-QualMin***  Parameter "Qqualmin" in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin. |
| ***q-RxlevMin, delta-RxLevMin***  Parameter "QRxLevmin" in TS 36.304 [4]. If *delta-RxLevMin* is not included, actual value Qrxlevmin = *q-RxLevMin* \* 2 [dBm]. If *delta-RxLevMin* is included, actual value Qrxlevmin = (*q-RxLevMin* + *delta-RxLevMin*) \* 2 [dBm]. |
| ***scptm-FreqOffset***  Parameter QoffsetSCPTM in TS 36.304 [4]. Actual value QoffsetSCPTM = field value \* 2 [dB].  If the field is absent, the UE uses infinite dBs for the SC-PTM frequency offset with cell ranking as specified in TS 36.304 [4]. |
| ***t-Reselection***  Parameter "TreselectionNB-IoT\_Inter" in TS 36.304 [4]. |

| Conditional presence | Explanation |
| --- | --- |
| *NSSS-RRM* | This field is optionally present, Need OR, when *nsss-RRM-Config* is present in *InterFreqCarrierFreqInfo*. Otherwise, the field is not present, and the UE shall delete any existing value for this field. |
| *Qrxlevmin* | This field is optionally present, Need OR, if *q-RxLevMin* is set to the minimum value. Otherwise the field is not present. |
| *TDD* | The field is optionally present, Need OR, in TDD. Otherwise, the field is not present. |

#### – *SystemInformationBlockType14-NB*

The IE *SystemInformationBlockType14-NB* contains the AB parameters for EPC and 5GC.

*SystemInformationBlockType14-NB* information element

-- ASN1START

SystemInformationBlockType14-NB-r13 ::= SEQUENCE {

ab-Param-r13 CHOICE {

ab-Common-r13 AB-Config-NB-r13,

ab-PerPLMN-List-r13 SEQUENCE (SIZE (1..maxPLMN-r11)) OF AB-ConfigPLMN-NB-r13

} OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[ ab-PerNRSRP-r15 ENUMERATED {thresh1, thresh2} OPTIONAL -- Need OR

]],

[[ uac-Param-r16 UAC-Param-NB-r16 OPTIONAL -- Need OR

]]

}

AB-ConfigPLMN-NB-r13 ::= SEQUENCE {

ab-Config-r13 AB-Config-NB-r13 OPTIONAL -- Need OR

}

AB-Config-NB-r13 ::= SEQUENCE {

ab-Category-r13 ENUMERATED {a, b, c},

ab-BarringBitmap-r13 BIT STRING (SIZE(10)),

ab-BarringForExceptionData-r13 ENUMERATED {true} OPTIONAL, -- Need OP

ab-BarringForSpecialAC-r13 BIT STRING (SIZE(5))

}

UAC-Param-NB-r16 ::= CHOICE {

uac-BarringCommon-r16 UAC-Barring-NB-r16,

uac-BarringPerPLMN-List-r16 SEQUENCE (SIZE (1..maxPLMN-r11)) OF UAC-Barring-NB-r16

}

UAC-Barring-NB-r16 ::= SEQUENCE {

uac-BarringPerCatList-r16 UAC-BarringPerCatList-NB-r16 OPTIONAL, -- Need OR

uac-AC1-SelectAssistInfo-r16 UAC-AC1-SelectAssistInfo-r15 OPTIONAL, -- Need OR

uac-BarringForAccessIdentity-r16 BIT STRING (SIZE(7))

}

UAC-BarringPerCatList-NB-r16 ::= SEQUENCE (SIZE (1..maxAccessCat-1-r15)) OF UAC-BarringPerCat-NB-r16

UAC-BarringPerCat-NB-r16 ::= SEQUENCE {

uac-accessCategory-r16 INTEGER (1..maxAccessCat-1-r15),

uac-BarringFactor-r16 ENUMERATED {p00, p05, p10, p15, p20, p25, p30, p40,

p50, p60, p70, p75, p80, p85, p90, p95},

uac-BarringTime-r16 ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512}

}

-- ASN1STOP

| *SystemInformationBlockType14-NB* field descriptions |
| --- |
| ***ab-BarringBitmap***  Access class barring for AC 0-9. The first/ leftmost bit is for AC 0, the second bit is for AC 1, and so on. |
| ***ab-BarringForExceptionData***  Indicates whether ExceptionData is subject to access barring. |
| ***ab-BarringForSpecialAC***  Access class barring for AC 11-15. The first/ leftmost bit is for AC 11, the second bit is for AC 12, and so on. |
| ***ab-Category***  Indicates the category of UEs for which AB applies. Value *a* corresponds to all UEs, value *b* corresponds to the UEs that are neither in their HPLMN nor in a PLMN that is equivalent to it, and value *c* corresponds to the UEs that are neither in the PLMN listed as most preferred PLMN of the country where the UEs are roaming in the operator-defined PLMN selector list on the USIM, nor in their HPLMN nor in a PLMN that is equivalent to their HPLMN, see TS 22.011 [10]. |
| ***ab-Common***  The AB parameters applicable for all PLMN(s). |
| ***ab-Param***  The AB parameters for connectivity to EPC |
| ***ab-PerNRSRP***  Access barring per NRSRP. Value *thresh1* corresponds to the first entry configured in *rsrp-ThresholdsPrachInfoList,* value *thresh2* corresponds to the second entry configured in *rsrp-ThresholdsPrachInfoList*. |
| ***ab-PerPLMN-List***  The AB parameters per PLMN, listed in the same order as the PLMN(s) occur in *plmn-IdentityList* in *SystemInformationBlockType1-NB*. |
| ***uac-AC1-SelectAssistInfo***  Information used to determine whether Access Category 1 applies to the UE, as defined in TS 22.261 [96]. The field is forwarded to upper layers, if present. |
| ***uac-accessCategory***  The Access Category according to TS 22.261 [96]. |
| ***uac-BarringCommon***  The UAC parameters applicable for all PLMN(s). |
| ***uac-BarringFactor***  Represents the probability that access attempt would be allowed during access barring check. |
| ***uac-BarringForAccessIdentity***  Indicates whether access attempt is allowed for each Access Identity. The leftmost bit, bit 0 in the bit string corresponds to Access Identity 1, bit 1 in the bit string corresponds to Access Identity 2, bit 2 in the bit string corresponds to Access Identity 11, bit 3 in the bit string corresponds to Access Identity 12, and so on. Value 0 means that access attempt is allowed for the corresponding access identity. |
| ***uac-BarringPerCatList***  Access control parameters for each access category for the specific PLMN. |
| ***uac-BarringPerPLMN-List***  The UAC parameters per PLMN, listed in the same order as the PLMN(s) occur in *plmn-IdentityList* in *SystemInformationBlockType1-NB*. |
| ***uac-BarringTime***  The minimum time before a new access attempt is to be performed after an access attempt was barred at access barring check for the same access category. |
| ***uac-Param***  The UAC parameters for connectivity to 5GC. |

#### – *SystemInformationBlockType15-NB*

The IE *SystemInformationBlockType15-NB* contains the MBMS Service Area Identities (SAI) of the current and/ or neighbouring carrier frequencies.

*SystemInformationBlockType15-NB* information element

-- ASN1START

SystemInformationBlockType15-NB-r14 ::= SEQUENCE {

mbms-SAI-IntraFreq-r14 MBMS-SAI-List-r11 OPTIONAL, -- Need OR

mbms-SAI-InterFreqList-r14 MBMS-SAI-InterFreqList-NB-r14 OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...

}

MBMS-SAI-InterFreqList-NB-r14 ::= SEQUENCE (SIZE (1..maxFreq)) OF MBMS-SAI-InterFreq-NB-r14

MBMS-SAI-InterFreq-NB-r14 ::= SEQUENCE {

dl-CarrierFreq-r14 CarrierFreq-NB-r13,

mbms-SAI-List-r14 MBMS-SAI-List-r11,

multiBandInfoList-r14 AdditionalBandInfoList-NB-r14 OPTIONAL -- Need OR

}

-- ASN1STOP

| *SystemInformationBlockType15-NB* field descriptions |
| --- |
| ***mbms-SAI-InterFreqList***  Contains a list of neighboring frequencies including additional frequency bands, if any, that provide MBMS services and the corresponding MBMS SAIs. |
| ***mbms-SAI-IntraFreq***  Contains the list of MBMS SAIs for the current frequency. A duplicate MBMS SAI indicates that this and all following SAIs are not offered by this cell but only by neighbour cells on the current frequency. For MBMS service continuity, the UE shall use all MBMS SAIs listed in *mbms-SAI-IntraFreq* to derive the MBMS frequencies of interest. |
| ***mbms-SAI-List***  Contains a list of MBMS SAIs for a specific frequency. |
| ***multiBandInfoList***  A list of additional frequency bands applicable for the cells participating in the SC-PTM transmission. |

#### – *SystemInformationBlockType16-NB*

The IE *SystemInformationBlockType16-NB* contains information related to GPS time and Coordinated Universal Time (UTC). The UE may use the parameters provided in this system information block to obtain the UTC, the GPS and the local time.

-- ASN1START

SystemInformationBlockType16-NB-r13 ::= SystemInformationBlockType16-r11

-- ASN1STOP

#### – *SystemInformationBlockType20-NB*

For FDD, the IE *SystemInformationBlockType20-NB* contains the information required to acquire the control information associated with transmission of MBMS using SC-PTM.

*SystemInformationBlockType20-NB* information element

-- ASN1START

SystemInformationBlockType20-NB-r14 ::= SEQUENCE {

npdcch-SC-MCCH-Config-r14 NPDCCH-SC-MCCH-Config-NB-r14,

sc-mcch-CarrierConfig-r14 CHOICE {

dl-CarrierConfig-r14 DL-CarrierConfigCommon-NB-r14,

dl-CarrierIndex-r14 INTEGER (0.. maxNonAnchorCarriers-NB-r14)

},

sc-mcch-RepetitionPeriod-r14 ENUMERATED {rf32, rf128, rf512, rf1024,

rf2048, rf4096, rf8192, rf16384},

sc-mcch-Offset-r14 INTEGER (0..10),

sc-mcch-ModificationPeriod-r14 ENUMERATED { rf32, rf128, rf256, rf512, rf1024,

rf2048, rf4096, rf8192, rf16384, rf32768,

rf65536, rf131072, rf262144, rf524288,

rf1048576, spare1},

sc-mcch-SchedulingInfo-r14 SC-MCCH-SchedulingInfo-NB-r14 OPTIONAL, -- Need OP

lateNonCriticalExtension OCTET STRING OPTIONAL,

...

}

NPDCCH-SC-MCCH-Config-NB-r14 ::= SEQUENCE {

npdcch-NumRepetitions-SC-MCCH-r14 ENUMERATED {r1, r2, r4, r8, r16,

r32, r64, r128, r256,

r512, r1024, r2048},

npdcch-StartSF-SC-MCCH-r14 ENUMERATED {v1dot5, v2, v4, v8,

v16, v32, v48, v64},

npdcch-Offset-SC-MCCH-r14 ENUMERATED {zero, oneEighth, oneQuarter,

threeEighth, oneHalf, fiveEighth,

threeQuarter, sevenEighth}

}

SC-MCCH-SchedulingInfo-NB-r14::= SEQUENCE {

onDurationTimerSCPTM-r14 ENUMERATED {

pp1, pp2, pp3, pp4,

pp8, pp16, pp32, spare},

drx-InactivityTimerSCPTM-r14 ENUMERATED {

pp0, pp1, pp2, pp3,

pp4, pp8, pp16, pp32},

schedulingPeriodStartOffsetSCPTM-r14 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),

sf2048 INTEGER(0..2047),

sf4096 INTEGER(0..4095),

sf8192 INTEGER(0..8191)

},

...

}

-- ASN1STOP

| ***SystemInformationBlockType20-NB* field descriptions** |
| --- |
| ***dl-CarrierConfig***  Downlink carrier used for SC-MCCH. E-UTRAN cannot configure a downlink carrier operating in mixed operation mode. |
| ***dl-CarrierIndex***  Index to a downlink carrier signalled in system information. Value '0' corresponds to the anchor carrier, value '1' corresponds to the first entry in *dl-ConfigList* in *SystemInformationBlockType22-NB,* value'2' corresponds to the second entry in *dl-ConfigList* and so on. |
| ***drx-InactivityTimerSCPTM***  Timer for SC-MCCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on. |
| ***npdcch-NumRepetitions-SC-MCCH***  The maximum number of NPDCCH repetitions the UE needs to monitor for SC-MCCH multicast search space, see TS 36.213 [23]. |
| ***npdcch-Offset-SC-MCCH***  Fractional period offset of starting subframe for NPDCCH multicast search space for SC-MCCH, see TS 36.213 [23]. |
| ***npdcch-StartSF-SC-MCCH***  Starting subframes configuration of the NPDCCH multicast search space for SC-MCCH, see TS 36.213 [23]. |
| ***onDurationTimerSCPTM***  Timer for SC-MCCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on. |
| ***schedulingPeriodStartOffsetSCPTM***  *SCPTM-SchedulingCycle* and *SCPTM-SchedulingOffset* in TS 36.321 [6]. The value of *SCPTM-SchedulingCycle* is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of *SCPTM-SchedulingOffset* is in number of sub-frames. |
| ***sc-mcch-CarrierConfig***  Downlink carrier that is used for SC-MCCH. |
| ***sc-mcch-ModificationPeriod***  Defines periodically appearing boundaries, i.e. radio frames for which (H-SFN \* 1024 +SFN) mod *sc-mcch-ModificationPeriod* = 0. The contents of different transmissions of SC-MCCH information can only be different if there is at least one such boundary in-between them. Value rf32 corresponds to 32 radio frames, value rf128 corresponds to 128 radio frames and so on. |
| ***sc-mcch-Offset***  Indicates, together with the sc-mcch-RepetitionPeriod, the boundary of the repetition period: (H-SFN \* 1024 +SFN) mod *sc-mcch-RepetitionPeriod* = sc-mcch-Offset. |
| ***sc-mcch-RepetitionPeriod***  Defines the interval between transmissions of SC-MCCH information, in radio frames. Value rf32 corresponds to 32 radio frames, rf128 corresponds to 128 radio frames and so on. |
| ***sc-mcch-SchedulingInfo***  DRX information for the SC-MCCH. If the field is absent, DRX is not used for SC-MCCH reception. |

#### – *SystemInformationBlockType22-NB*

The IE *SystemInformationBlockType22-NB* contains radio resource configuration for paging and random access procedure on non-anchor carriers.

*SystemInformationBlockType22-NB* information element

-- ASN1START

SystemInformationBlockType22-NB-r14 ::= SEQUENCE {

dl-ConfigList-r14 DL-ConfigCommonList-NB-r14 OPTIONAL, -- Need OR

ul-ConfigList-r14 UL-ConfigCommonList-NB-r14 OPTIONAL, -- Need OR

pagingWeightAnchor-r14 PagingWeight-NB-r14 OPTIONAL, -- Cond pcch-config

nprach-ProbabilityAnchorList-r14 NPRACH-ProbabilityAnchorList-NB-r14 OPTIONAL, -- Cond nprach-config

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[ mixedOperationModeConfig-r15 SEQUENCE {

dl-ConfigListMixed-r15 DL-ConfigCommonList-NB-r14 OPTIONAL, -- Cond dl-ConfigList

ul-ConfigListMixed-r15 UL-ConfigCommonList-NB-r14 OPTIONAL, -- Cond ul-ConfigList

pagingDistribution-r15 ENUMERATED {true} OPTIONAL, -- Need OR

nprach-Distribution-r15 ENUMERATED {true} OPTIONAL -- Need OR

} OPTIONAL, -- Need OR

ul-ConfigList-r15 UL-ConfigCommonListTDD-NB-r15 OPTIONAL -- Cond TDD

]]

}

DL-ConfigCommonList-NB-r14 ::= SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF

DL-ConfigCommon-NB-r14

UL-ConfigCommonList-NB-r14 ::= SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF

UL-ConfigCommon-NB-r14

UL-ConfigCommonListTDD-NB-r15 ::= SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF

UL-ConfigCommonTDD-NB-r15

DL-ConfigCommon-NB-r14 ::= SEQUENCE {

dl-CarrierConfig-r14 DL-CarrierConfigCommon-NB-r14,

pcch-Config-r14 PCCH-Config-NB-r14 OPTIONAL, -- Need OR

...,

[[ wus-Config-r15 WUS-ConfigPerCarrier-NB-r15 OPTIONAL -- Cond WUS

]],

[[ gwus-Config-r16 CHOICE {

useWUS NULL,

explicit WUS-ConfigPerCarrier-NB-r15

} OPTIONAL -- Cond GWUS

]]

}

PCCH-Config-NB-r14 ::= SEQUENCE {

npdcch-NumRepetitionPaging-r14 ENUMERATED {

r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1} OPTIONAL, -- Need OP

pagingWeight-r14 PagingWeight-NB-r14 DEFAULT w1,

...

}

PagingWeight-NB-r14 ::= ENUMERATED {w1, w2, w3, w4, w5, w6, w7, w8,

w9, w10, w11, w12, w13, w14, w15, w16}

UL-ConfigCommon-NB-r14 ::= SEQUENCE {

ul-CarrierFreq-r14 CarrierFreq-NB-r13,

nprach-ParametersList-r14 NPRACH-ParametersList-NB-r14 OPTIONAL, -- Need OR

...,

[[ nprach-ParametersListEDT-r15 NPRACH-ParametersList-NB-r14 OPTIONAL -- Cond EDT

]]

}

UL-ConfigCommonTDD-NB-r15 ::= SEQUENCE {

tdd-UL-DL-AlignmentOffset-r15 TDD-UL-DL-AlignmentOffset-NB-r15,

nprach-ParametersListTDD-r15 NPRACH-ParametersListTDD-NB-r15 OPTIONAL, -- Need OR

...

}

NPRACH-ProbabilityAnchorList-NB-r14 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF

NPRACH-ProbabilityAnchor-NB-r14

NPRACH-ProbabilityAnchor-NB-r14 ::= SEQUENCE {

nprach-ProbabilityAnchor-r14 ENUMERATED {

zero, oneSixteenth, oneFifteenth, oneFourteenth,

oneThirteenth, oneTwelfth, oneEleventh, oneTenth,

oneNinth, oneEighth, oneSeventh, oneSixth,

oneFifth, oneFourth, oneThird, oneHalf}

OPTIONAL -- Need OP

}

-- ASN1STOP

| *SystemInformationBlockType22-NB* field descriptions |
| --- |
| ***dl-CarrierConfig***  For FDD: Provides the configuration of the DL non-anchor carrier.  For TDD: Provides the configuration of the non-anchor carrier. |
| ***dl-ConfigList, dl-ConfigListMixed***  For FDD: List of DL non-anchor carriers and associated configuration that can be used for paging and/or random access. E-UTRAN configures DL non-anchor carriers operating in mixed operation mode only in *dl-ConfigListMixed* and only a UE that supports mixed operation mode uses the carriers in *dl-ConfigListMixed*. A given carrier is either signalled in the *dl-ConfigList* or in *dl-ConfigListMixed*.  If *dl-ConfigListMixed* is present and at least one of the carriers in *dl-ConfigListMixed* is configured for paging:  - If *pagingDistribution* is present, the UE supporting mixed operation mode creates a combined list of DL carriers for paging by appending *dl-ConfigListMixed* to the *dl-ConfigList* while maintaining the order among *dl-ConfigList* and *dl-ConfigListMixed*; the total number of signalled DL non-anchor carriers cannot be more than *maxNonAnchorCarriers-NB-r14*.  - If *pagingDistribution* is absent, the UE supporting mixed operation mode uses the list of DL carriers for paging provided in *dl-ConfigListMixed* and considers *pagingWeightAncho*r being set to w0, i.e. the anchor carrier is not used*.*  Otherwise, the *pagingDistribution* field is not applicable and the UE shall ignore the value.  For TDD: List of non-anchor carriers and associated configuration that can be used for paging and/or random access. |
| ***gwus-Config***  For FDD: Carrier specific GWUS Configuration.  E-UTRAN configures value *explicit* only if *wus-Config* is not present for the carrier. |
| ***mixedOperationModeConfig***  For FDD: Provides the configuration of DL and UL non-anchor carriers that can be used for paging and random access by a UE that supports mixed operation mode.  For TDD: This parameter is absent. |
| ***npdcch-NumRepetitionPaging***  Maximum number of repetitions for NPDCCH common search space (CSS) for paging, see TS 36.213 [23], clause 16.6.  If the field is absent, the value *of npdcch-NumRepetitionPaging* configured in *SystemInformationBlockType2-NB* in IE *pcch-Config* applies. |
| ***nprach-Distribution***  Indicates which UL carriers a UE supporting mixed operation mode uses for random access as defined in description of *ul-ConfigList, ul-ConfigListMixed*. |
| ***nprach-ParametersList, nprach-ParametersList-EDT***  Configure NPRACH parameters for each NPRACH resource on one non-anchor UL carrier. Up to three NPRACH resources can be configured on one non-anchor UL carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.  NPRACH resources in *nprach-ParametersListEDT* are used to initiateEDT. Each NPRACH resource is associated with a maximum TBS signalled in the corresponding entry of *edt-TBS-InfoList* in *SystemInformationBlockType2-NB*.  E-UTRAN includes the same number of entries, and listed in the same order, as in *nprach-ParametersList* in *SystemInformationBlockType2-NB*. |
| ***nprach-ParametersListTDD***  For TDD: Configure NPRACH parameters for each NPRACH resource on one non-anchor UL carrier. Up to three NPRACH resources can be configured on one non-anchor UL carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.  E-UTRAN includes the same number of entries in *nprach-ParametersListTDD*, and listed in the same order, as in *nprach-ParametersListTDD* in *SystemInformationBlockType2-NB*.. |
| ***nprach-ProbabilityAnchor***  Configure the selection probability for the anchor carrier NPRACH resource, see TS 36.321 [6]. Value zero corresponds to a probability of 0, oneSixteenth corresponds to the probability of 1/16, oneFifteenth corresponds to the probability of 1/15, and so on.  If the field is absent, the selection probability of the anchor carrier NPRACH resource is 1.  All non-anchor carriers NPRACH resources have equal probability between them.  If there is no NPRACH resource defined on the anchor carrier for one repetition level in *nprach-ParametersList-EDT*, (respectively *nprach-ParametersListFmt2*, *nprach-ParametersListFmt2-EDT*), the UE shall use the value 'zero' and ignore the signalled value of *nprach-ProbabilityAnchor* for this repetition level for the NPRACH resources defined by *nprach-ParametersList-EDT* (respectively *nprach-ParametersListFmt2*, *nprach-ParametersListFmt2-EDT*). |
| ***nprach-ProbabilityAnchorList***  Configures the selection probability for each NPRACH resource on the anchor carrier.  E-UTRAN includes the same number of entries, and listed in the same order, as in *nprach-ParametersList* in *SystemInformationBlockType2-NB.* |
| ***pagingDistribution***  Indicates which DL carriers a UE supporting mixed operation mode monitors for paging as defined in description of *dl-ConfigList, dl-ConfigListMixed*. |
| ***pagingWeight***  Weight of the non-anchor paging carrier for uneven paging load distribution across the carriers. Value w1 corresponds to a relative weight of 1, w2 corresponds to a relative weight of 2, and so on.  The paging load for a carrier 'i' is equal to w(i)/W where i is equal to 0 for the anchor carrier and equal to the index of the carrier in the *dl-ConfigList* / *dl-ConfigListMixed* for a non-anchor carrier, W is the sum of the weights of all paging carriers.  To avoid correlation between paging carrier and paging occasion, the weights should be assigned such that: nB \* W <= 16384. |
| ***pagingWeightAnchor***  Weight of the anchor carrier for uneven paging load distribution across the carriers. Value w1 corresponds to a relative weight of 1, w2 corresponds to a relative weight of 2, and so on.  If the field is absent, the (default) value of w0 is applied, i.e. the anchor carrier is not used for paging. |
| ***pcch-Config***  Configure the PCCH parameters for the non-anchor DL carrier. |
| ***tdd-UL-DL-AlignmentOffset***  Indicates the offset between the UL carrier frequency center with respect to DL carrier frequency center for the non-anchor carrier. |
| ***ul-CarrierFreq***  For FDD: UL carrier frequency of the non-anchor carrier as defined in TS 36.101 [42], clause 5.7.3F.  For TDD: This field is absent and the uplink carrier frequency is same as the downlink frequency. |
| ***ul-ConfigList, ul-ConfigListMixed***  For FDD: List of UL non-anchor carriers and associated configuration that can be used for random access. E-UTRAN configures UL non-anchor carriers operating in mixed operation mode only in *ul-ConfigListMixed* and only a UE that supports mixed operation mode uses the carriers in *ul-ConfigListMixed*. A given carrier is either signalled in the *ul-ConfigList* or in *ul-ConfigListMixed*.  If *ul-ConfigListMixed* is present and at least one of the carriers in *ul-ConfigListMixed* is configured for random access:  - If *nprach-Distribution* is present, the UE supporting mixed operation mode creates a combined list of UL carriers for random access by appending *ul-ConfigListMixed* to the *ul-ConfigList* while maintaining the order among both *ul-ConfigList* and *ul-ConfigListMixed*; the total number of signalled UL non-anchor carriers cannot be more than *maxNonAnchorCarriers-NB-r14*.  - If *nprach-Distribution* is absent, the UE supporting mixed operation mode uses the list of UL carriers for random access provided in *ul-ConfigListMixed* and considers *nprach-ProbabiliyAnchor* being set to zero for each NPRACH resource, i.e. the anchor carrier is not used for random access*.*  Otherwise, the *nprach-Distribution* field is not applicable and the UE shall ignore the value.  For TDD: E-UTRAN configures *ul-ConfigList-r15* and includes the same number of entries as in *dl-ConfigList*. The UL carrier frequency of the non-anchor carrier is same as the DL carrier frequency. |
| ***wus-Config***  For FDD: Carrier specific WUS Configuration. |

| Conditional presence | Explanation |
| --- | --- |
| *dl-ConfigList* | This field is optionally present, Need OR, if the field *dl-ConfigList* is present. Otherwise the field is not present. |
| *EDT* | The field is optionally present, Need OR, if *edt-Parameters* in *SystemInformationBlockType2-NB* is present; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *GWUS* | This field is optionally present, Need OR, if g*wus-Config-r16* is present in *SystemInformationBlockType2-NB*. Otherwise the field is not present. |
| *pcch-config* | This field is optionally present, Need OP, if the field *dl-ConfigList* is present and at least one of the carriers in *dl-ConfigList* is configured for paging. Otherwise the field is not present and only the anchor carrier is used for paging. |
| *nprach-config* | This field is mandatory present, if the field *ul-ConfigList* is present and at least one of the carriers in *ul-ConfigList* is configured for random access. Otherwise the field is not present and only the anchor carrier is used for random access. |
| *TDD* | This field is optionally present, Need OR, for TDD. Otherwise the field is not present. |
| *ul-ConfigList* | This field is optionally present, Need OR, if the field *ul-ConfigList* is present. Otherwise the field is not present. |
| *WUS* | This field is mandatory present, if the field *wus-Config* is present in *SystemInformationBlockType2-NB*. Otherwise the field is not present, Need OR. |

#### – *SystemInformationBlockType23-NB*

For FDD, the IE *SystemInformationBlockType23-NB* contains radio resource configuration for NPRACH resources using preamble format 2 on non-anchor carriers.

*SystemInformationBlockType23-NB* information element

-- ASN1START

SystemInformationBlockType23-NB-r15 ::= SEQUENCE {

ul-ConfigList-v1530 UL-ConfigCommonList-NB-v1530 OPTIONAL, -- Need OR

ul-ConfigListMixed-v1530 UL-ConfigCommonList-NB-v1530 OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...

}

UL-ConfigCommonList-NB-v1530 ::= SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF

UL-ConfigCommon-NB-v1530

UL-ConfigCommon-NB-v1530 ::= SEQUENCE {

nprach-ParametersListFmt2-r15 NPRACH-ParametersListFmt2-NB-r15 OPTIONAL, -- Need OR

nprach-ParametersListFmt2EDT-r15 NPRACH-ParametersListFmt2-NB-r15 OPTIONAL, -- Cond EDT

...

}

-- ASN1STOP

| SystemInformationBlockType23-NB field descriptions |
| --- |
| ***nprach-ParametersListFmt2, nprach-ParametersListFmt2EDT***  Configures NPRACH parameters for each NPRACH resource format 2 on one UL carrier. Up to three NPRACH resources can be configured on one carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.  The NPRACH resources in *nprach-ParametersListFmt2EDT* are used to initiateEDT. Each NPRACH resource is associated with a TBS signalled in the corresponding entry of *edt-TBS-InfoList.*  E-UTRAN configures the NPRACH resources format 2 so that they do not overlap in time domain with the NPRACH resources configured in *nprach-ParametersList* and *nprach-ParametersListEDT* on the same UL carrier.  If there is no NPRACH resource in *nprach-ParametersListFmt2* (respectively *nprach-ParametersListFmt2EDT*) on any UL carrier, including the anchor carrier, for one NPRACH repetition level, the UE uses the NPRACH resources in *nprach-ParametersList* (respectively *nprach-ParametersListEDT*) for this NPRACH repetition level. Otherwise, the UE uses only NPRACH resources in *nprach-ParametersListFmt2* (respectively *nprach-ParametersListFmt2EDT*).  If E-UTRAN configures NPRACH resources format 2 in one NPRACH repetition level, the E-UTRAN configures NPRACH resources format 2 in all NPRACH repetition levels upwards. |
| ***ul-ConfigList, ul-ConfigListMixed***  *ul-ConfigList* (respectively *ul-ConfigListMixed*) is parallel to *ul-ConfigList* (respectively *ul-ConfigListMixed*) in *SystemInformationBlockType22-NB*.  E-UTRAN includes the same number of entries and in the same order in *ul-ConfigList* (respectively *ul-ConfigListMixed*) in *SystemInformationBlockType23-NB* as in *ul-ConfigList* (respectively *ul-ConfigListMixed*) in *SystemInformationBlockType22-NB.* The UE combines each entry in *ul-ConfigList* (respectively *ul-ConfigListMixed*) in *SystemInformationBlockType23-NB* with the corresponding entry in *ul-ConfigList* (respectively *ul-ConfigListMixed*) in *SystemInformationBlockType22-NB*. |

| Conditional presence | Explanation |
| --- | --- |
| *EDT* | The field is optionally present, Need OR, if *edt-Parameters* in *SystemInformationBlockType2-NB* is present; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *SystemInformationBlockType27-NB*

The IE *SystemInformationBlockType27-NB* contains assistance information relevant only for inter-RAT cell selection i.e. assistance information about E-UTRA frequencies and/ or GERAN frequencies for cell selection.

*SystemInformationBlockType27-NB* information element

-- ASN1START

SystemInformationBlockType27-NB-r16 ::= SEQUENCE {

carrierFreqListEUTRA-r16 CarrierFreqListEUTRA-NB-r16 OPTIONAL, -- Need OR

carrierFreqsListGERAN-r16 CarrierFreqsListGERAN-NB-r16 OPTIONAL, -- Need OR

lateNonCriticalExtension OCTET STRING OPTIONAL,

...

}

CarrierFreqListEUTRA-NB-r16 ::= SEQUENCE (SIZE (1.. maxFreqEUTRA-NB-r16)) OF

CarrierFreqEUTRA-NB-r16

CarrierFreqsListGERAN-NB-r16 ::= SEQUENCE (SIZE (1.. maxFreqsGERAN-NB-r16)) OF

CarrierFreqsGERAN-NB-r16

CarrierFreqEUTRA-NB-r16 ::= SEQUENCE {

carrierFreq-r16 ARFCN-ValueEUTRA-r9,

sib1-r16 ENUMERATED {supported} OPTIONAL, -- Need OR

sib1-BR-r16 ENUMERATED {supported} OPTIONAL, -- Need OR

...

}

CarrierFreqsGERAN-NB-r16 ::= SEQUENCE {

carrierFreqs-r16 CarrierFreqsGERAN,

ec-GSM-IOT-r16 ENUMERATED {supported} OPTIONAL, -- Need OR

peo-r16 ENUMERATED {supported} OPTIONAL, -- Need OR

...

}

-- ASN1STOP

| *SystemInformationBlockType27-NB* field descriptions |
| --- |
| ***carrierFreq***  E-UTRAN carrier frequency. |
| ***carrierFreqListEUTRA***  Provides a list of neighbouring E-UTRA carrier frequencies, which may be searched for neighbouring E-UTRAN cells. |
| ***carrierFreqs***  The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies. |
| ***carrierFreqsListGERAN***  Provides a list of neighbouring GERAN carrier frequencies, which may be searched for neighbouring GERAN cells. The GERAN carrier frequencies are organised in groups and the parameters are indicated per group of GERAN carrier frequencies. |
| ***ec-GSM-IOT***  This field indicates that the GERAN carrier frequencies support EC-GSM-IOT. |
| ***peo***  This field indicates that the GERAN carrier frequencies support Power Efficient Operation (PEO). |
| ***sib1***  This field indicates that SIB1 is scheduled in the E-UTRAN cells. |
| ***sib1-BR***  This field indicates that SIB1-BR is scheduled in the E-UTRAN cells. |

#### 6.7.3.2 NB-IoT Radio resource control information elements

#### – *CarrierConfigDedicated-NB*

The IE *CarrierConfigDedicated-NB* is used to specify a carrier in NB-IoT.

*CarrierConfigDedicated-NB* information elements

-- ASN1START

CarrierConfigDedicated-NB-r13 ::= SEQUENCE {

dl-CarrierConfig-r13 DL-CarrierConfigDedicated-NB-r13,

ul-CarrierConfig-r13 UL-CarrierConfigDedicated-NB-r13

}

DL-CarrierConfigDedicated-NB-r13 ::= SEQUENCE {

dl-CarrierFreq-r13 CarrierFreq-NB-r13,

downlinkBitmapNonAnchor-r13 CHOICE {

useNoBitmap-r13 NULL,

useAnchorBitmap-r13 NULL,

explicitBitmapConfiguration-r13 DL-Bitmap-NB-r13,

spare NULL

} OPTIONAL, -- Need ON

dl-GapNonAnchor-r13 CHOICE {

useNoGap-r13 NULL,

useAnchorGapConfig-r13 NULL,

explicitGapConfiguration-r13 DL-GapConfig-NB-r13,

spare NULL

} OPTIONAL, -- Need ON

inbandCarrierInfo-r13 SEQUENCE {

samePCI-Indicator-r13 CHOICE {

samePCI-r13 SEQUENCE {

indexToMidPRB-r13 INTEGER (-55..54)

},

differentPCI-r13 SEQUENCE {

eutra-NumCRS-Ports-r13 ENUMERATED {same, four}

}

} OPTIONAL, -- Cond anchor-guardband-or-standalone

eutraControlRegionSize-r13 ENUMERATED {n1, n2, n3}

} OPTIONAL, -- Cond non-anchor-inband

...,

[[ nrs-PowerOffsetNonAnchor-v1330 ENUMERATED {dB-12, dB-10, dB-8, dB-6,

dB-4, dB-2, dB0, dB3}

OPTIONAL -- Need ON

]],

[[ dl-GapNonAnchor-v1530 DL-GapConfig-NB-v1530 OPTIONAL -- Cond TDD1

]],

[[ dl-CarrierFreq-v1550 CarrierFreq-NB-v1550 OPTIONAL -- Cond TDD1

]]

}

UL-CarrierConfigDedicated-NB-r13 ::= SEQUENCE {

ul-CarrierFreq-r13 CarrierFreq-NB-r13 OPTIONAL, -- Need OP

...,

[[ tdd-UL-DL-AlignmentOffset-r15 TDD-UL-DL-AlignmentOffset-NB-r15 OPTIONAL -- Cond TDD

]]

}

-- ASN1STOP

| *CarrierConfigDedicated-NB* field descriptions |
| --- |
| ***dl-CarrierConfig***  Downlink carrier used for all unicast transmissions. |
| ***dl-CarrierFreq***  DL carrier frequency. The downlink carrier is not in a E-UTRA PRB which contains E-UTRA PSS/SSS/PBCH. |
| ***dl-GapNonAnchor***  Downlink transmission gap configuration for the anchor/ non-anchor carrier, see TS 36.211 [21], clause 10.2.3.4.  E-UTRAN may configure *dl-GapNonAnchor-v1530* only if *dl-GapNonAnchor-r13* is set to *explicitGapConfiguration*. |
| ***downlinkBitmapNonAnchor***  For FDD: NB-IoT downlink subframe configuration for downlink transmission on the anchor/ non-anchor carrier. See TS 36.213 [23], clause 16.4.  For TDD: NB-IoT downlink, uplink and special subframes configuration for transmission on the anchor/ non-anchor carrier. See TS 36.213 [23], clause 16.4. |
| ***eutraControlRegionSize***  Indicates the control region size of the E-UTRA cell for the in-band operation mode, see TS 36.213 [23]. Unit is in number of OFDM symbols. If *operationModeInfo* in MIB-NB is set to *inband-SamePCI* or *inband-DifferentPCI*, it should be set to the value broadcast in SIB1-NB. |
| ***eutra-NumCRS-Ports***  Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23]. |
| ***inbandCarrierInfo***  Provides the configuration of the anchor/ non-anchor inband carrier. If *operationModeInfo* is set to standalone in the MIB-NB, E-UTRAN only configures this field if the UE supports mixed operation mode. |
| ***indexToMidPRB***  The PRB index is signaled by offset from the middle of the EUTRA system. |
| ***nrs-PowerOffsetNonAnchor***  Provides the power offset of the downlink narrowband reference-signal EPRE of the anchor/ non-anchor carrier relative to the anchor carrier, unit in dB. Value dB-12 corresponds to -12 dB, dB-10 corresponds to -10 dB and so on. See TS 36.213 [23], clause16.2.2. |
| ***samePCI-Indicator***  This parameter specifies whether the anchor/ non-anchor carrier reuses the same PCI as the EUTRA carrier. |
| ***ul-CarrierConfig***  Uplink anchor/ non-anchor carrier used for all unicast transmissions. |
| ***ul-CarrierFreq***  For FDD: UL carrier frequency as defined in TS 36.101 [42], clause 5.7.3F. If absent, the same TX-RX frequency separation and carrier frequency offset as for the anchor carrier applies.  For TDD: This field is absent and the uplink carrier frequency is equal to the downlink frequency. |

| Conditional presence | Explanation |
| --- | --- |
| *non-anchor-inband* | The field is mandatory present if the anchor/ non-anchor carrier is an inband carrier; otherwise it is not present. |
| *anchor-guardband-or-standalone* | The field is mandatory present if *operationModeInfo* is set to *guardband* or *standalone* in the MIB; otherwise it is not present. |
| *TDD* | The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *TDD1* | The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *CarrierFreq-NB*

The IE *CarrierFreq-NB* is used to provide the NB-IoT carrier frequency, as defined in TS 36.101 [42].

*CarrierFreq-NB* information elements

-- ASN1START

CarrierFreq-NB-r13 ::= SEQUENCE {

carrierFreq-r13 ARFCN-ValueEUTRA-r9,

carrierFreqOffset-r13 ENUMERATED {

v-10, v-9, v-8, v-7, v-6, v-5, v-4, v-3, v-2, v-1, v-0dot5,

v0, v1, v2, v3, v4, v5, v6, v7, v8, v9

} OPTIONAL -- Need ON

}

CarrierFreq-NB-v1550 ::= SEQUENCE {

carrierFreqOffset-v1550 ENUMERATED {v-8dot5, v-4dot5, v3dot5, v7dot5}

}

-- ASN1STOP

| *CarrierFreq-NB* field descriptions |
| --- |
| ***carrierFreq***  Provides the ARFCN applicable for the NB-IoT carrier frequency as defined in TS 36.101 [42], Table 5.7.3-1. |
| ***carrierFreqOffset***  Offset of the NB-IoT channel number to EARFCN as defined in TS 36.101 [42], clause 5.7.3F. Value v-10 means -10, v-9 means -9, and so on. E-UTRAN may configure the values v-8dot5, v-4dot5, v3dot5 and v7dot5 only for a carrier in a TDD band.  For TDD, the UE shall use the value signalled in *carrierFreqOffset-v1550*, if present, and ignore the value signaled in *carrierFreqOffset-r13*. |

#### *– ChannelRasterOffset-NB*

The IE *ChannelRasterOffset-NB* is used to specify the NB-IoT offset from LTE channel raster. Unit in kHz in set { -7.5, -2.5, 2.5, 7.5} See TS 36.211[21] and TS 36.213 [23].

***ChannelRasterOffset-NB* information element**

-- ASN1START

ChannelRasterOffset-NB-r13 ::= ENUMERATED {khz-7dot5, khz-2dot5, khz2dot5, khz7dot5}

-- ASN1STOP

#### – *DL-Bitmap-NB*

The IE *DL-Bitmap-NB* is used to specify the set of NB-IoT downlink subframes for downlink transmission.

*DL-Bitmap-NB* information element

-- ASN1START

DL-Bitmap-NB-r13 ::= CHOICE {

subframePattern10-r13 BIT STRING (SIZE (10)),

subframePattern40-r13 BIT STRING (SIZE (40))

}

-- ASN1STOP

| *DL-Bitmap-NB* field descriptions |
| --- |
| ***subframePattern10, subframePattern40***  For FDD: NB-IoT downlink subframe configuration over 10ms or 40ms for inband and 10ms for standalone/guardband.  For TDD: NB-IoT downlink, uplink and special subframes configuration over 10ms or 40ms for inband and 10ms for standalone/guardband.  The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod x = 0, where x is the size of the bit string divided by 10. Value 0 in the bitmap indicates that the corresponding subframe is invalid for transmission. Value 1 in the bitmap indicates that the corresponding subframe is valid for transmission. |

#### – *DL-CarrierConfigCommon-NB*

The IE *DL-CarrierConfigCommon-NB is* used to specify the common configuration of a DL non-anchor carrier in NB-IoT.

*DL-CarrierConfigCommon-NB* information elements

-- ASN1START

DL-CarrierConfigCommon-NB-r14 ::= SEQUENCE {

dl-CarrierFreq-r14 CarrierFreq-NB-r13,

downlinkBitmapNonAnchor-r14 CHOICE {

useNoBitmap-r14 NULL,

useAnchorBitmap-r14 NULL,

explicitBitmapConfiguration-r14 DL-Bitmap-NB-r13

},

dl-GapNonAnchor-r14 CHOICE {

useNoGap-r14 NULL,

useAnchorGapConfig-r14 NULL,

explicitGapConfiguration-r14 DL-GapConfig-NB-r13

},

inbandCarrierInfo-r14 SEQUENCE {

samePCI-Indicator-r14 CHOICE {

samePCI-r14 SEQUENCE {

indexToMidPRB-r14 INTEGER (-55..54)

},

differentPCI-r14 SEQUENCE {

eutra-NumCRS-Ports-r14 ENUMERATED {same, four}

}

} OPTIONAL, -- Cond anchor-guardband-or-standalone

eutraControlRegionSize-r14 ENUMERATED {n1, n2, n3}

} OPTIONAL, -- Cond non-anchor-inband

nrs-PowerOffsetNonAnchor-r14 ENUMERATED {dB-12, dB-10, dB-8, dB-6,

dB-4, dB-2, dB0, dB3} DEFAULT dB0,

...,

[[ dl-GapNonAnchor-v1530 DL-GapConfig-NB-v1530 OPTIONAL -- Cond TDD

]],

[[ dl-CarrierFreq-v1550 CarrierFreq-NB-v1550 OPTIONAL -- Cond TDD

]]

}

-- ASN1STOP

| *DL-CarrierConfigCommon-NB* field descriptions |
| --- |
| ***dl-CarrierFreq***  DL carrier frequency. The downlink carrier is not in a E-UTRA PRB which contains E-UTRA PSS/SSS/PBCH. |
| ***dl-GapNonAnchor***  Downlink transmission gap configuration for the non-anchor carrier, see TS 36.211 [21], clause 10.2.3.4.  E-UTRAN may configure *dl-GapNonAnchor-v1530* only if *dl-GapNonAnchor-r14* is set to *explicitGapConfiguration*. |
| ***downlinkBitmapNonAnchor***  For FDD: NB-IoT downlink subframe configuration for downlink transmission on the non-anchor carrier. See TS 36.213 [23], clause 16.4.  For TDD: NB-IoT downlink, uplink and special subframes configuration for transmission on the anchor/ non-anchor carrier. See TS 36.213 [23], clause 16.4. |
| ***eutraControlRegionSize***  Indicates the control region size of the E-UTRA cell for the in-band operation mode, see TS 36.213 [23]. Unit is in number of OFDM symbols. If *operationModeInfo* in MIB-NB is set to *inband-SamePCI* or *inband-DifferentPCI*, it should be set to the value broadcast in SIB1-NB. |
| ***eutra-NumCRS-Ports***  Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23]. |
| ***inbandCarrierInfo***  Provides the configuration of a non-anchor inband carrier. |
| ***indexToMidPRB***  The PRB index is signaled by offset from the middle of the EUTRA system. |
| ***nrs-PowerOffsetNonAnchor***  Provides the downlink narrowband reference-signal EPRE offset of the non-anchor carrier relative to the downlink narrowband reference-signal EPRE of the anchor carrier, unit in dB. Value dB-12 corresponds to -12 dB, dB-10 corresponds to -10 dB and so on. See TS 36.213 [23], clause 16.2.2. |
| ***samePCI-Indicator***  This parameter specifies whether the non-anchor carrier reuses the same PCI as the EUTRA carrier. |

| Conditional presence | Explanation |
| --- | --- |
| *non-anchor-inband* | The field is mandatory present if the non-anchor carrier is an inband carrier; otherwise it is not present. |
| *anchor-guardband-or-standalone* | The field is mandatory present, if *operationModeInfo* is set to *guardband* or *standalone* in the MIB; otherwise it is not present. |
| *TDD* | The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *DL-GapConfig-NB*

The IE *DL-GapConfig-NB* is used to specify the downlink gap configuration for NPDCCH and NPDSCH. Downlink gaps apply to all NPDCCH/NPDSCH transmissions except for BCCH.

*DL-GapConfig-NB* information element

-- ASN1START

DL-GapConfig-NB-r13 ::= SEQUENCE {

dl-GapThreshold-r13 ENUMERATED {n32, n64, n128, n256},

dl-GapPeriodicity-r13 ENUMERATED {sf64, sf128, sf256, sf512},

dl-GapDurationCoeff-r13 ENUMERATED {oneEighth, oneFourth, threeEighth, oneHalf}

}

DL-GapConfig-NB-v1530 ::= SEQUENCE {

dl-GapPeriodicity-v1530 ENUMERATED {sf1024}

}

-- ASN1STOP

| *DL-GapConfig-NB* field descriptions |
| --- |
| ***dl-GapDurationCoeff***  Coefficient to calculate the gap duration of a DL transmission: dl-GapDurationCoeff \* dl-GapPeriodicity, Duration in number of subframes. See TS 36.211 [21], clause 10.2.3.4. |
| ***dl-GapPeriodicity***  Periodicity of a DL transmission gap in number of subframes. See TS 36.211 [21], clause 10.2.3.4.  Value *sf64* corresponds to 64 subframes, value *sf128* corresponds to 128 subframes, value *sf256* corresponds to 256 subframes and so on. E-UTRAN may configure the value *sf64* only in FDD mode and the value *sf1024* only in TDD mode.  The UE shall use the value signalled in *dl-GapPeriodicity-v1530*, if present, and ignore the value signaled in *dl-GapPeriodicity-r13*. |
| ***dl-GapThreshold***  Threshold on the maximum number of repetitions configured for NPDCCH before application of DL transmission gap configuration. See TS 36.211 [21], clause 10.2.3.4. |

#### *– GWUS-Config-NB*

The IE G*WUS-Config-NB* is used to specify the GWUS configuration. For UEs supporting GWUS, E-UTRAN uses GWUS to indicate that the UE shall attempt to receive paging in that cell, see TS 36.304 [4].

*GWUS-Config-NB information element*

-- ASN1START

GWUS-Config-NB-r16 ::= SEQUENCE {

groupAlternation-r16 ENUMERATED {true} OPTIONAL, -- Need OR

commonSequence-r16 ENUMERATED {g0, g126} OPTIONAL, -- Need OR

timeParameters-r16 WUS-Config-NB-r15 OPTIONAL, -- Cond noWUSr15

resourceConfigDRX-r16 GWUS-ResourceConfig-NB-r16,

resourceConfig-eDRX-Short-r16 GWUS-ResourceConfig-NB-r16 OPTIONAL, -- Need OP

resourceConfig-eDRX-Long-r16 GWUS-ResourceConfig-NB-r16 OPTIONAL, -- Cond timeOffset

probThreshList-r16 GWUS-ProbThreshList-NB-r16

OPTIONAL, -- Cond probabilityBased

...

}

GWUS-ResourceConfig-NB-r16 ::= SEQUENCE {

resourcePosition-r16 ENUMERATED {primary, secondary},

numGroupsList-r16 SEQUENCE (SIZE (1..maxGWUS-Resources-NB-r16)) OF

GWUS-NumGroups-NB-r16 OPTIONAL, -- Need OP

groupsForServiceList-r16 SEQUENCE (SIZE (1..maxGWUS-ProbThresholds-NB-r16)) OF

INTEGER (1..maxGWUS-Groups-1-NB-r16)

OPTIONAL -- Cond probabilityBased

}

GWUS-NumGroups-NB-r16 ::= ENUMERATED {n1, n2, n4, n8}

GWUS-ProbThreshList-NB-r16 ::= SEQUENCE (SIZE (1..maxGWUS-ProbThresholds-NB-r16)) OF GWUS-Paging-ProbThresh-NB-r16

GWUS-Paging-ProbThresh-NB-r16 ::= ENUMERATED {p20, p30, p40, p50, p60, p70, p80, p90}

-- ASN1STOP

| *GWUS-Config-NB* field descriptions |
| --- |
| ***commonSequence***  Presence of the field indicates common WUS sequence is configured.  Value *g0* indicates common WUS sequence for the shared WUS resource is g=0, value *g126* indicates common WUS sequence for the shared WUS resource is g=126, see TS 36.211[21]. |
| ***groupAlternation***  Presence of the field enables WUS group alternation between the two WUS resources for the gap type, see TS 36.304[4]. |
| ***groupsForServiceList***  Number of WUS groups for each paging probability group, see TS 36.304 [4]. The first entry corresponds to the first probability group, second entry corresponds to the second paging probability group, and so on.  Any WUS group from the list of WUS groups defined in the *numWUS-GroupsPerResourceList* that are not assigned to a probability group is considered to be part of the list used for UE ID based group only list.  Total number of WUS groups in this list cannot be more than total number of WUS groups in *gwus-NumGroupsList*. |
| ***numGroupsList***  List of WUS groups for each WUS resource, see TS 36.304 [4]. First entry corresponds to the first resource, the second entry corresponds to the second resource.  *numGroupsList* shall be present in *resourceConfigDRX*.  If *numGroupsList* is not present in *resourceconfig-eDRX-Short*, parameters for DRX WUS resource applies for short eDRX WUS resource.  If *numGroupsList* is not present in *resourceConfig-eDRX-Long*, parameters for shour eDRX WUS resource applies for long eDRX WUS resource. |
| ***probThreshList***  Paging probability thresholds corresponding to the paging probability groups, see TS 36.304 [4]. Value *p20* corresponds to 20%, value *p30* corresponds to 30%, and so on. |
| ***resourceConfigDRX, resourceConfig-eDRX-Short, resourceConfig-eDRX-Long***  WUS resource configured for each gap type, see TS 36.304 [4].  If *resourceConfig-eDRX-Short* is not present, DRX WUS parameters apply for short eDRX WUS resource.  If *resourceConfig-eDRX-Long* is not present, short eDRX WUS parameters apply for long eDRX WUS resource. |
| ***resourcePosition***  Indicates the position of the WUS resource corresponding to the first entry in *numGroupsList-r16*  Value *primary* indicates that the end of the WUS resource is defined by the timeoffset value for the corresponding gap type, value *secondary* indicates that the end of the WUS resource is immediately before the WUS resource configured by *wus-Config-r15*.  E-UTRAN may only configure *secondary* when there is only one entry exists in *numGroupsList-r16* and *wus-Config-r15* is present in *SystemInformationBlockType2-NB*.  If two entries exist in *numGroupsList-r16*, the position for the second WUS resource corresponds to value *secondary*. |

|  |  |
| --- | --- |
| Conditional presence | Explanation |
| *noWUSr15* | The field is mandatory present if *wus-Config-r15* is not present in *SystemInformationBlockType2-NB*; otherwise the field is not present, and the UE shall delete any existing value for this field. |
| *probabilityBased* | The field is mandatory present if paging probability based WUS group selection is configured; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *timeOffset* | The field is optionally present, Need OP, if *timeOffset-eDRX-Long* is present in *timeParameters*; otherwise the field is not present, and the UE shall delete any existing value for this field. |

#### – *LogicalChannelConfig-NB*

The IE *LogicalChannelConfig-NB* is used to configure the logical channel parameters.

*LogicalChannelConfig-NB* information element

-- ASN1START

LogicalChannelConfig-NB-r13 ::= SEQUENCE {

priority-r13 INTEGER (1..16) OPTIONAL, -- Cond UL

logicalChannelSR-Prohibit-r13 BOOLEAN OPTIONAL, -- Need ON

...

}

-- ASN1STOP

| *LogicalChannelConfig-NB* field descriptions |
| --- |
| ***logicalChannelSR-Prohibit***  Value *TRUE* indicates that the *logicalChannelSR-ProhibitTimer* is enabled for the logical channel. If *logicalChannelSR-Prohibit* is configured (i.e. indicates value *TRUE*), E-UTRAN also configures *logicalChannelSR-ProhibitTimer*. See TS 36.321 [6]. |
| ***priority***  Logical channel priority in TS 36.321 [6]. Value is an integer. |

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

#### – *MAC-MainConfig-NB*

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

*MAC-MainConfig-NB* information element

-- ASN1START

MAC-MainConfig-NB-r13 ::= SEQUENCE {

ul-SCH-Config-r13 SEQUENCE {

periodicBSR-Timer-r13 PeriodicBSR-Timer-NB-r13 OPTIONAL, -- Need ON

retxBSR-Timer-r13 RetxBSR-Timer-NB-r13

} OPTIONAL, -- Need ON

drx-Config-r13 DRX-Config-NB-r13 OPTIONAL, -- Need ON

timeAlignmentTimerDedicated-r13 TimeAlignmentTimer,

logicalChannelSR-Config-r13 CHOICE {

release NULL,

setup SEQUENCE {

logicalChannelSR-ProhibitTimer-r13 ENUMERATED {

pp2, pp8, pp32, pp128, pp512,

pp1024, pp2048, spare}

}

} OPTIONAL, -- Need ON

...,

[[ rai-Activation-r14 ENUMERATED {true} OPTIONAL, -- Need OR

dataInactivityTimerConfig-r14 CHOICE {

release NULL,

setup SEQUENCE {

dataInactivityTimer-r14 DataInactivityTimer-r14

}

} OPTIONAL -- Need ON

]],

[[ drx-Cycle-v1430 ENUMERATED {

sf1280, sf2560, sf5120, sf10240} OPTIONAL -- Need ON

]],

[[ ra-CFRA-Config-r14 ENUMERATED {true} OPTIONAL -- Need ON

]]

}

PeriodicBSR-Timer-NB-r13 ::= ENUMERATED {

pp2, pp4, pp8, pp16, pp64, pp128, infinity, spare}

RetxBSR-Timer-NB-r13 ::= ENUMERATED {

pp4, pp16, pp64, pp128, pp256, pp512, infinity, spare}

DRX-Config-NB-r13 ::= CHOICE {

release NULL,

setup SEQUENCE {

onDurationTimer-r13 ENUMERATED {

pp1, pp2, pp3, pp4, pp8, pp16, pp32, spare},

drx-InactivityTimer-r13 ENUMERATED {

pp0, pp1, pp2, pp3, pp4, pp8, pp16, pp32},

drx-RetransmissionTimer-r13 ENUMERATED {

pp0, pp1, pp2, pp4, pp6, pp8, pp16, pp24,

pp33, spare7, spare6, spare5,

spare4, spare3, spare2, spare1},

drx-Cycle-r13 ENUMERATED {

sf256, sf512, sf1024, sf1536, sf2048, sf3072,

sf4096, sf4608, sf6144, sf7680, sf8192, sf9216,

spare4, spare3, spare2, spare1},

drx-StartOffset-r13 INTEGER (0..255),

drx-ULRetransmissionTimer-r13 ENUMERATED {

pp0, pp1, pp2, pp4, pp6, pp8, pp16, pp24,

pp33, pp40, pp64, pp80, pp96,

pp112, pp128, pp160, pp320}

}

}

-- ASN1STOP

| *MAC-MainConfig*-*NB* field descriptions |
| --- |
| ***drx-Config***  Used to configure DRX as specified in TS 36.321 [6]. |
| ***drx-Cycle***  *longDRX-Cycle* in TS 36.321 [6]. The value of l*ongDRX-Cycle* is in number of sub-frames. Value sf256 corresponds to 256 sub-frames, sf512 corresponds to 512 sub-frames and so on. In case *drx-Cycle-v1430* is signalled, the UE shall ignore *drx-Cycle-r13*. |
| ***drx-StartOffset***  *drxStartOffset* in TS 36.321 [6]. Value is in number of sub-frames by step of (*drx-cycle* / 256). |
| ***drx-InactivityTimer***  Timer for DRX in TS 36.321 [6]. Value in number of PDCCH periods. Value pp0 corresponds to 0 PDCCH period and behaviour as specified in 7.3.2 applies, pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on. |
| ***drx-RetransmissionTimer***  Timer for DRX in TS 36.321 [6]. Value in number of PDCCH periods. Value pp0 corresponds to 0 PDCCH period and behaviour as specified in 7.3.2 applies, pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on. |
| ***drx-ULRetransmissionTimer***  Timer for DRX in TS 36.321 [6].  Value in number of PDCCH periods. Value pp0 corresponds to 0 PDCCH period and behaviour as specified in 7.3.2 applies, value pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on. |
| ***logicalChannelSR-ProhibitTimer***  Timerused to delay the transmission of an SR*.* See TS 36.321 [6]. Value in number of PDCCH periods. Value pp2 corresponds to 2 PDCCH periods, pp8 corresponds to 8 PDCCH periods and so on. |
| ***periodicBSR-Timer***  Timer for BSR reporting in TS 36.321 [6].  Value in number of PDCCH periods. Value pp2 corresponds to 2 PDCCH periods, pp4 corresponds to 4 PDCCH periods and so on. |
| ***ra-CFRA-Config***  Activation of contention free random access (CFRA), see TS 36.321 [6]. |
| ***rai-Activation***  Activation of release assistance indication (RAI) in TS 36.321 [6]. |
| ***retxBSR-Timer***  Timer for BSR reporting in TS 36.321 [6]. Value in number of PDCCH periods. Value pp4 corresponds to 4 PDCCH periods, pp16 corresponds to 16 PDCCH periods and so on. |
| ***onDurationTimer***  Timer for DRX in TS 36.321 [6]. Value in number of PDCCH periods. Value pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on. |
| ***timeAlignmentTimer***  Indicates the value of the time alignment timer, see TS 36.321 [6]. |







#### – *NPDCCH-ConfigDedicated-NB*

The IE *NPDCCH-ConfigDedicated-NB* specifies the subframes and resource blocks for NPDCCH monitoring.

*NPDCCH-ConfigDedicated-NB* information element

-- ASN1START

NPDCCH-ConfigDedicated-NB-r13 ::= SEQUENCE {

npdcch-NumRepetitions-r13 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1},

npdcch-StartSF-USS-r13 ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v48, v64},

npdcch-Offset-USS-r13 ENUMERATED {zero, oneEighth, oneFourth, threeEighth}

}

NPDCCH-ConfigDedicated-NB-v1530 ::= SEQUENCE {

npdcch-StartSF-USS-v1530 ENUMERATED {v96, v128}

}

-- ASN1STOP

| *NPDCCH-ConfigDedicated-NB* field descriptions |
| --- |
| ***npdcch-NumRepetitions***  Maximum number of repetitions for NPDCCH UE specific search space (USS), see TS 36.213 [23], clause 16.6. UE monitors one set of values (consisting of aggregation level, number of repetitions and number of blind decodes) according to the configured maximum number of repetitions. |
| ***npdcch-Offset-USS***  Fractional period offset of starting subframe for NPDCCH UE specific search space (USS), see TS 36.213 [23], clause 16.6. |
| ***npdcch-StartSF-USS***  Starting subframe configuration for an NPDCCH UE-specific search space, see TS 36.213 [23], clause 16.6. Value v1dot5 corresponds to 1.5, value 2 corresponds to 2 and so on. E-UTRAN may configure values *v1dot5* and *v2* only in FDD mode and values *v96* and *v128* only in TDD mode.  The UE shall use the value signalled in *npdcch-StartSF-USS-v1530,* if present, and ignore the value signalled in *npdcch-StartSF-USS-r13*. |

#### – *NPDSCH-Config-NB*

The IE *NPDSCH-ConfigCommon-NB* is used to specify the common NPDSCH configuration. The IE *NPDSCH-ConfigDedicated-NB* is used to specify the UE specific NPDSCH configuration.

*NPDSCH-Config-NB* information element

-- ASN1START

NPDSCH-ConfigCommon-NB-r13 ::= SEQUENCE {

nrs-Power-r13 INTEGER (-60..50)

}

NPDSCH-ConfigDedicated-NB-r16 ::= SEQUENCE {

npdsch-MultiTB-Config-r16 NPDSCH-MultiTB-Config-NB-r16 OPTIONAL -- Cond twoHARQ

}

NPDSCH-MultiTB-Config-NB-r16 ::= SEQUENCE {

multiTB-Config-r16 ENUMERATED {interleaved, nonInterleaved},

harq-ACK-Bundling-r16 ENUMERATED {true} OPTIONAL -- Cond interleaved

}

-- ASN1STOP

| *NPDSCH-Config-NB* field descriptions |
| --- |
| ***multiTB-Config***  For FDD: Activation of multiple TBs scheduling in DL, see TS 36.213 [23]. Value *interleaved* indicates that multiple TBs scheduling with interleaved transmission is enabled, value *nonInterleaved* indicates that multiple TBs scheduling without interleaved transmission is enabled. |
| ***harq-ACK-Bundling***  For FDD: Activation of HARQ ACK bundling for DL multiple TBs scheduling with interleaved transmission, see TS 36.213 [23]. |
| ***nrs-Power***  Provides the downlink narrowband reference-signal EPRE, see TS 36.213 [23], clause 16.2. The actual value in dBm. |

| Conditional presence | Explanation |
| --- | --- |
| *interleaved* | The field is optionally present, Need OR, if *multiTB-Config* is set to *interleaved*; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *twoHARQ* | The field is optionally present, Need OR, if *twoHARQ-ProcessesConfig* is configured; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *NPRACH-ConfigSIB-NB*

The IE *NPRACH-ConfigSIB-NB* is used to specify the NPRACH configuration for the anchor and non-anchor carriers.

*NPRACH-ConfigSIB-NB* information elements

-- ASN1START

NPRACH-ConfigSIB-NB-r13 ::= SEQUENCE {

nprach-CP-Length-r13 ENUMERATED {us66dot7, us266dot7},

rsrp-ThresholdsPrachInfoList-r13 RSRP-ThresholdsNPRACH-InfoList-NB-r13 OPTIONAL, -- Need OR

nprach-ParametersList-r13 NPRACH-ParametersList-NB-r13

}

NPRACH-ConfigSIB-NB-v1330 ::= SEQUENCE {

nprach-ParametersList-v1330 NPRACH-ParametersList-NB-v1330

}

NPRACH-ConfigSIB-NB-v1450 ::= SEQUENCE {

maxNumPreambleAttemptCE-r14 ENUMERATED {n3, n4, n5, n6, n7, n8, n10, spare1}

}

NPRACH-ConfigSIB-NB-v1530 ::= SEQUENCE {

tdd-Parameters-r15 SEQUENCE {

nprach-PreambleFormat-r15 ENUMERATED {

fmt0, fmt1, fmt2, fmt0-a, fmt1-a},

dummy ENUMERATED {

n1, n2, n4, n8, n16, n32, n64, n128,

n256, n512, n1024},

nprach-ParametersListTDD-r15 NPRACH-ParametersListTDD-NB-r15

} OPTIONAL, -- Cond TDD

fmt2-Parameters-r15 SEQUENCE {

nprach-ParametersListFmt2-r15 NPRACH-ParametersListFmt2-NB-r15 OPTIONAL, -- Need OR

nprach-ParametersListFmt2EDT-r15 NPRACH-ParametersListFmt2-NB-r15 OPTIONAL -- Cond EDT2

} OPTIONAL, -- Need OR

edt-Parameters-r15 SEQUENCE {

edt-SmallTBS-Subset-r15 ENUMERATED {true} OPTIONAL, -- Need OR

edt-TBS-InfoList-r15 EDT-TBS-InfoList-NB-r15,

nprach-ParametersListEDT-r15 NPRACH-ParametersList-NB-r14 OPTIONAL -- Need OR

} OPTIONAL -- Cond EDT1

}

NPRACH-ConfigSIB-NB-v1550 ::= SEQUENCE {

tdd-Parameters-v1550 SEQUENCE {

nprach-ParametersListTDD-v1550 NPRACH-ParametersListTDD-NB-v1550

}

}

NPRACH-ParametersList-NB-r13 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r13

NPRACH-ParametersList-NB-v1330 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-v1330

NPRACH-Parameters-NB-r13::= SEQUENCE {

nprach-Periodicity-r13 ENUMERATED {ms40, ms80, ms160, ms240,

ms320, ms640, ms1280, ms2560},

nprach-StartTime-r13 ENUMERATED {ms8, ms16, ms32, ms64,

ms128, ms256, ms512, ms1024},

nprach-SubcarrierOffset-r13 ENUMERATED {n0, n12, n24, n36, n2, n18, n34, spare1},

nprach-NumSubcarriers-r13 ENUMERATED {n12, n24, n36, n48},

nprach-SubcarrierMSG3-RangeStart-r13 ENUMERATED {zero, oneThird, twoThird, one},

maxNumPreambleAttemptCE-r13 ENUMERATED {n3, n4, n5, n6, n7, n8, n10, spare1},

numRepetitionsPerPreambleAttempt-r13 ENUMERATED {n1, n2, n4, n8, n16, n32, n64, n128},

npdcch-NumRepetitions-RA-r13 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1},

npdcch-StartSF-CSS-RA-r13 ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v48, v64},

npdcch-Offset-RA-r13 ENUMERATED {zero, oneEighth, oneFourth, threeEighth}

}

NPRACH-Parameters-NB-v1330 ::= SEQUENCE {

nprach-NumCBRA-StartSubcarriers-r13 ENUMERATED {n8, n10, n11, n12, n20, n22, n23, n24,

n32, n34, n35, n36, n40, n44, n46, n48}

}

NPRACH-ParametersList-NB-r14 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF

NPRACH-Parameters-NB-r14

NPRACH-Parameters-NB-r14 ::= SEQUENCE {

nprach-Parameters-r14 SEQUENCE {

nprach-Periodicity-r14 ENUMERATED {ms40, ms80, ms160, ms240,

ms320, ms640, ms1280, ms2560}

OPTIONAL, -- NEED OP

nprach-StartTime-r14 ENUMERATED {ms8, ms16, ms32, ms64,

ms128, ms256, ms512, ms1024}

OPTIONAL, -- NEED OP

nprach-SubcarrierOffset-r14 ENUMERATED {n0, n12, n24, n36, n2, n18, n34, spare1}

OPTIONAL, -- NEED OP

nprach-NumSubcarriers-r14 ENUMERATED {n12, n24, n36, n48}

OPTIONAL, -- NEED OP

nprach-SubcarrierMSG3-RangeStart-r14 ENUMERATED {zero, oneThird, twoThird, one}

OPTIONAL, -- NEED OP

npdcch-NumRepetitions-RA-r14 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1}

OPTIONAL, -- NEED OP

npdcch-StartSF-CSS-RA-r14 ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v48, v64}

OPTIONAL, -- NEED OP

npdcch-Offset-RA-r14 ENUMERATED {zero, oneEighth, oneFourth, threeEighth}

OPTIONAL, -- NEED OP

nprach-NumCBRA-StartSubcarriers-r14 ENUMERATED {n8, n10, n11, n12, n20, n22, n23, n24,

n32, n34, n35, n36, n40, n44, n46, n48}

OPTIONAL, -- NEED OP

npdcch-CarrierIndex-r14 INTEGER (1..maxNonAnchorCarriers-NB-r14)

OPTIONAL, -- Need OP

...

} OPTIONAL -- Need OR

}

NPRACH-ParametersListTDD-NB-r15 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF

NPRACH-ParametersTDD-NB-r15

NPRACH-ParametersTDD-NB-r15 ::= SEQUENCE {

nprach-Parameters-r15 SEQUENCE {

nprach-Periodicity-r15 ENUMERATED {ms80, ms160, ms320, ms640,

ms1280, ms2560, ms5120, ms10240}

OPTIONAL, -- NEED OP

nprach-StartTime-r15 ENUMERATED {ms10, ms20, ms40, ms80,

ms160, ms320, ms640, ms1280,

ms2560, ms5120, spare6, spare5,

spare4, spare3, spare2, spare1}

OPTIONAL, -- NEED OP

nprach-SubcarrierOffset-r15 ENUMERATED {n0, n12, n24, n36, n2, n18, n34, spare1}

OPTIONAL, -- NEED OP

nprach-NumSubcarriers-r15 ENUMERATED {n12, n24, n36, n48}

OPTIONAL, -- NEED OP

nprach-SubcarrierMSG3-RangeStart-r15 ENUMERATED {zero, oneThird, twoThird, one}

OPTIONAL, -- NEED OP

npdcch-NumRepetitions-RA-r15 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1}

OPTIONAL, -- NEED OP

npdcch-StartSF-CSS-RA-r15 ENUMERATED {v4, v8, v16, v32, v48, v64, v96, v128}

OPTIONAL, -- NEED OP

npdcch-Offset-RA-r15 ENUMERATED {zero, oneEighth, oneFourth, threeEighth}

OPTIONAL, -- NEED OP

nprach-NumCBRA-StartSubcarriers-r15 ENUMERATED {n8, n10, n11, n12, n20, n22, n23, n24,

n32, n34, n35, n36, n40, n44, n46, n48}

OPTIONAL, -- NEED OP

...

} OPTIONAL -- Need OR

}

NPRACH-ParametersListTDD-NB-v1550 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF

NPRACH-ParametersTDD-NB-v1550

NPRACH-ParametersTDD-NB-v1550 ::= SEQUENCE {

maxNumPreambleAttemptCE-v1550 ENUMERATED {n3, n4, n5, n6, n7, n8, n10, spare1},

numRepetitionsPerPreambleAttempt-v1550 ENUMERATED {n1, n2, n4, n8, n16, n32, n64, n128,

n256, n512, n1024}

}

NPRACH-ParametersListFmt2-NB-r15 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-ParametersFmt2-NB-r15

NPRACH-ParametersFmt2-NB-r15 ::= SEQUENCE {

nprach-Parameters-r15 SEQUENCE {

nprach-Periodicity-r15 ENUMERATED {ms40, ms80, ms160, ms320,

ms640, ms1280, ms2560, ms5120}

OPTIONAL, -- NEED OP

nprach-StartTime-r15 ENUMERATED {ms8, ms16, ms32, ms64,

ms128, ms256, ms512, ms1024}

OPTIONAL, -- NEED OP

nprach-SubcarrierOffset-r15 ENUMERATED {n0, n36, n72, n108, n6, n54, n102, n42,

n78, n90, n12, n24, n48, n84, n60, n18}

OPTIONAL, -- NEED OP

nprach-NumSubcarriers-r15 ENUMERATED {n36, n72, n108, n144}

OPTIONAL, -- NEED OP

nprach-SubcarrierMSG3-RangeStart-r15 ENUMERATED {zero, oneThird, twoThird, one}

OPTIONAL, -- NEED OP

npdcch-NumRepetitions-RA-r15 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1}

OPTIONAL, -- NEED OP

npdcch-StartSF-CSS-RA-r15 ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v48, v64}

OPTIONAL, -- NEED OP

npdcch-Offset-RA-r15 ENUMERATED {zero, oneEighth, oneFourth, threeEighth}

OPTIONAL, -- NEED OP

nprach-NumCBRA-StartSubcarriers-r15 ENUMERATED {

n24, n30, n33, n36, n60, n66, n69, n72,

n96, n102, n105, n108, n120, n132, n138, n144}

OPTIONAL, -- NEED OP

npdcch-CarrierIndex-r15 INTEGER (1..maxNonAnchorCarriers-NB-r14)

OPTIONAL, -- Need OP

...

} OPTIONAL -- Need OR

}

RSRP-ThresholdsNPRACH-InfoList-NB-r13 ::= SEQUENCE (SIZE(1..2)) OF RSRP-Range

EDT-TBS-InfoList-NB-r15 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF EDT-TBS-NB-r15

EDT-TBS-NB-r15 ::= SEQUENCE {

edt-SmallTBS-Enabled-r15 BOOLEAN,

edt-TBS-r15 ENUMERATED {b328, b408, b504, b584, b680, b808, b936, b1000}

}

-- ASN1STOP

| *NPRACH-ConfigSIB-NB* field descriptions |
| --- |
| ***dummy***  This field is not used in the specification. If received it shall be ignored by the UE. |
| ***edt-SmallTBS-Enabled***  Value TRUE indicates UE performing EDT is allowed to select TBS smaller than *edt-TBS* for Msg3 according to the corresponding NPRACH resource, as specified in TS 36.213 [23]. |
| ***edt-SmallTBS-Subset***  Presence indicates only two of the TBS values can be used according to *edt-TBS* corresponding to the NPRACH resource, as specified in TS 36.213 [23]. When the field is not present, any of the TBS values according to *edt-TBS* corresponding to the NPRACH resource can be used. This field is applicable for a NPRACH resource only when *edt-SmallTBS-Enabled* is included for the corresponding NPRACH resource. |
| ***edt-TBS***  Largest TBS for Msg3 for a NPRACH resource applicable to a UE performing EDT. Value in bits. Value b328 corresponds to 328 bits, value b408 corresponds to 408 bits and so on. See TS 36.213 [23]. |
| ***maxNumPreambleAttemptCE***  Maximum number of preamble transmission attempts per NPRACH resource. See TS 36.321 [6].  If the UE supports enhanced random access power control and *maxNumPreambleAttemptCE-r14* is included, the UE shall use *maxNumPreambleAttemptCE-r14* instead of *maxNumPreambleAttemptCE-r13* for the first entry in *nprach-ParametersList*.  *maxNumPreambleAttemptCE-r13* applies to FDD and *maxNumPreambleAttemptCE-v1550* applies to TDD. |
| ***npdcch-CarrierIndex***  For FDD: Index of the carrier in the list of DL non anchor carriers. The first entry in the list has index '1', the second entry has index '2' and so on.  If the UE supports mixed operation mode and *dl-ConfigListMixed* is present in *systemInformationBlockType22-NB*, the UE creates a combined list of DL carriers for random access by appending *dl-ConfigListMixed* to the *dl-ConfigList* while maintaining the order among both *dl-ConfigList* and *dl-ConfigListMixed*; only the first *maxNonAnchorCarriers-NB-r14* DL non-anchor carriers in the concatenated list can be used for random access.  If the field is absent in the entry in *nprach-ParametersListEDT* in *SystemInformationBlockType22-NB*, the value of *npdcch-CarrierIndex* in the corresponding entry of *nprach-ParametersList* applies, if present. If the field is absent in an entry in *nprach-ParametersListFmt2EDT* in *SystemInformationBlockType23-NB*, the value of *npdcch-CarrierIndex* in the corresponding entry of *nprach-ParametersListFmt2* applies, if present. Otherwise, the DL anchor carrier is used.  For TDD: This parameter is absent and the same carrier is used in uplink and downlink. |
| ***npdcch-NumRepetitions-RA***  Maximum number of repetitions for NPDCCH common search space (CSS) for RAR, Msg3 retransmission and Msg4, see TS 36.213 [23], clause 16.6.  See NOTE. |
| ***npdcch-Offset -RA***  Fractional period offset of starting subframe for NPDCCH common search space (CSS Type 2), see TS 36.213 [23], clause 16.6.  See NOTE. |
| ***npdcch-StartSF-CSS-RA***  Starting subframe configuration for NPDCCH common search space (CSS), including RAR, Msg3 retransmission, and Msg4, see TS 36.213 [23], clause 16.6.  See NOTE. |
| ***nprach-CP-Length***  Cyclic prefix length for NPRACH transmission (TCP), see TS 36.211 [21], clause 10.1.6. Value us66dot7 corresponds to 66.7 microseconds and value us266dot7 corresponds to 266.7 microseconds. If the UE uses a NPRACH resource for preamble format 2*,* the UE ignores the value signalled in *nprach-CP-Length* and considers the value to be800 microseconds. |
| ***nprach-NumCBRA-StartSubcarriers***  The number of start subcarriers from which a UE can randomly select a start subcarrier as specified in TS 36.321 [6].  If *nprach-Config-v1330* is not included in *SystemInformationBlockType2-NB*, the UE sets the value of *nprach-NumCBRA-StartSubcarriers-r13* to the value signalled by *nprach-NumSubcarriers-r13* for the corresponding NPRACH resource.  The start subcarrier indices that the UE is allowed to randomly select from, are given by:  *nprach-SubcarrierOffset* + [0, *nprach-NumCBRA-StartSubcarriers* - 1].  See NOTE. |
| ***nprach-NumSubcarriers***  Number of sub-carriers in a NPRACH resource, see TS 36.211 [21], clause 10.1.6. In number of subcarriers.  See NOTE. |
| ***nprach-ParametersList, nprach-ParametersListEDT***  Configures NPRACH parameters for each NPRACH resource. Up to three PRACH resources can be configured in *nprach-ParametersList* in a cell. Each NPRACH resource is associated with a different number of NPRACH repetitions.  The NPRACH resources in *nprach-ParametersListEDT* are used to initiateEDT. Each NPRACH resource is associated with a TBS signalled in the corresponding entry of *edt-TBS-InfoList.*  For TDD: The UE shall use *nprach-ParametersListTDD* and ignore *nprach-ParametersList.* |
| ***nprach-ParametersListTDD***  For TDD: Configure NPRACH parameters for each NPRACH. Up to three NPRACH resources can be configured in a cell. Each NPRACH resource is associated with a different number of NPRACH repetitions. |
| ***nprach-ParametersListFmt2, nprach-ParametersListFmt2EDT***  Configures NPRACH parameters for each NPRACH resource format 2. Up to three NPRACH resources can be configured on one carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.  The NPRACH resources in *nprach-ParametersListFmt2EDT* are used to initiate EDT. Each NPRACH resource is associated with a TBS signalled in the corresponding entry of *edt-TBS-InfoList.*  E-UTRAN configures the NPRACH resources format 2 so that they do not overlap in time domain with the NPRACH resources configured in *nprach-ParametersList* and *nprach-ParametersListEDT*.  If there is no NPRACH resource in *nprach-ParametersListFmt2* (respectively *nprach-ParametersListFmt2EDT*) on any UL carrier for one NPRACH repetition level, the UE uses the NPRACH resources in *nprach-ParametersList* (respectively *nprach-ParametersListEDT*) for this NPRACH repetition level. Otherwise, the UE uses only NPRACH resources in *nprach-ParametersListFmt2* (respectively *nprach-ParametersListFmt2EDT*). |
| ***nprach-Periodicity***  Periodicity of a NPRACH resource, see TS 36.211 [21], clause10.1.6. Unit in millisecond.  See NOTE. |
| ***nprach-PreambleFormat***  TDD: TDD preamble format, see TS 36.211 [21]. clause 10.1.6,  Value *fmt0* corresponds to preamble format 0, value *fmt1* corresponds to preamble format 1 and so on. |
| ***nprach-StartTime***  Start time of the NPRACH resource in one period, see TS 36.211 [21], clause 10.1.6. Unit in millisecond.  See NOTE. |
| ***nprach-SubcarrierOffset***  Frequency location of the NPRACH resource, see TS 36.211 [21], clause 10.1.6. In number of subcarriers, offset from sub-carrier 0.  See NOTE. |
| ***nprach-SubcarrierMSG3-RangeStart***  Fraction for calculating the starting subcarrier index of the range reserved for indication of UE support for multi-tone Msg3 transmission, within the NPRACH resource, see TS 36.211 [21], clause 10.1.6. Multi-tone Msg3 transmission is not supported for {32, 64, 128} repetitions of NPRACH. For at least one of the NPRACH resources with the number of NPRACH repetitions other than {32, 64, 128}, the value of *nprach-SubcarrierMSG3-RangeStart* should not be 0.  If *nprach-SubcarrierMSG3-RangeStart* is equal to zero, no start subcarrier index for the single-tone Msg3 NPRACH is allocated and the start subcarrier indexes for the multi-tone Msg3 NPRACH partition are given by *nprach-SubcarrierOffset* + [0, *nprach-NumCBRA-StartSubcarriers* - 1].  If *nprach-SubcarrierMSG3-RangeStart* is equal to oneThirdor twoThird, the start subcarrier indexes for the two partitions are given by:  *nprach-SubcarrierOffset* + [0, floor(*nprach-NumCBRA-StartSubcarriers \** *nprach-SubcarrierMSG3-RangeStart*) -1]  for the single-tone Msg3 NPRACH partition;  *nprach-SubcarrierOffset* + [floor(*nprach-NumCBRA-StartSubcarriers \* nprach-SubcarrierMSG3-RangeStart*)*, nprach-NumCBRA-StartSubcarriers* - 1]  for the multi-tone Msg3 NPRACH partition;  If *nprach-SubcarrierMSG3-RangeStart* is equal to one, the start subcarrier indexes for the single-tone Msg3 NPRACH are given by *nprach-SubcarrierOffset* + [0, *nprach-NumCBRA-StartSubcarriers* - 1] and no start subcarrier index for the multi-tone Msg3 NPRACH partition is allocated.  See NOTE. |
| ***numRepetitionsPerPreambleAttempt***  Number of NPRACH repetitions per attempt for each NPRACH resource, See TS 36.211 [21], clause 10.1.6. *numRepetitionsPerPreambleAttempt-r13* applies to FDD and *numRepetitionsPerPreambleAttempt-v1550* applies to TDD. |
| ***rsrp-ThresholdsPrachInfoList***  The criterion for UEs to select a NPRACH resource. Up to 2 RSRP threshold values can be signalled. The first element corresponds to RSRP threshold 1, the second element corresponds to RSRP threshold 2. See TS 36.321 [6]. If absent, there is only one NPRACH resource.  A UE that supports *powerClassNB-14dBm-r14* shall correct the RSRP threshold values before applying them as follows:  RSRP threshold = Signalled RSRP threshold - min{0, (14-min(23, P-Max))} where P-Max*:*is the value of *p-Max* field in *SystemInformationBlockType1-NB.* |

NOTE:

- If the field is absent in an entry of *nprach-ParametersList* in *SystemInformationBlockType22-NB*, the value of the same field in the corresponding entry of *nprach-ParametersList* in *SystemInformationBlockType2-NB* applies.

- If the field is absent in the entry in *nprach-ParametersListEDT*, the value of the same field in the corresponding entry of *nprach-ParametersList* on the same UL carrierapplies, if present. Otherwise, the value of the same field in the corresponding entry of *nprach-ParametersList* in *SystemInformationBlockType2-NB* applies.

- If the field is absent in an entry of *nprach-ParametersListTDD* in *SystemInformationBlockType22-NB*, the value of the same field in the corresponding entry of *nprach-ParametersListTDD* in *SystemInformationBlockType2-NB* applies. The field is mandatory present in *nprach-ParametersListTDD* in *SystemInformationBlockType2-NB.*

- If the field is absent in an entry of *nprach-ParametersListFmt2* in *SystemInformationBlockType23-NB*, the value of the same field, if present, in the corresponding entry of *nprach-ParametersListFmt2* in *SystemInformationBlockType2-NB* applies. Otherwise the value of the same field, if present,in thecorresponding entry of the first occurence of *nprach-ParametersListFmt2* in the non anchor carrier list applies. Otherwise, the value of the same field in the corresponding entry of *nprach-ParametersList* in *SystemInformationBlockType2-NB* applies.

- If the field is absent in an entry of *nprach-ParametersListFmt2* in *SystemInformationBlockType2-NB*, the value of the same field in the corresponding entry of *nprach-ParametersList* in *SystemInformationBlockType2-NB* applies.

- If the field is absent in an entry of *nprach-ParametersListFmt2EDT* in *SystemInformationBlockType23-NB*, the value of the same field, if present, in the corresponding entry of *nprach-ParametersListFmt2* on the same UL carrierapplies. Otherwise, the value of the same field, if present, in the corresponding entry of *nprach-ParametersListFmt2* in *SystemInformationBlockType2-NB* applies. Otherwise the value of the same field, if present,in thecorresponding entry of the first occurence of *nprach-ParametersListFmt2* in the non anchor carrier list applies. Otherwise, the value of the same field in the corresponding entry of *nprach-ParametersList* in *SystemInformationBlockType2-NB* applies.

- If the field is absent in an entry of *nprach-ParametersListFmt2EDT* in *SystemInformationBlockType2-NB*, the value of the same field, if present, in the corresponding entry of *nprach-ParametersListFmt2* in *SystemInformationBlockType2-NB* applies. Otherwise the value of the same field in the corresponding entry of *nprach-ParametersList* in *SystemInformationBlockType2-NB* applies.

| Conditional presence | Explanation |
| --- | --- |
| *EDT1* | The field is mandatory present if *cp-EDT*, *cp-EDT-5GC*, *up-EDT* or *up-EDT-5GC* in *SystemInformationBlockType2-NB* is present; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *EDT2* | The field is optionally present, Need OR, if *edt-Parameters* is present; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *TDD* | This field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *NPUSCH-Config-NB*

The IE *NPUSCH-ConfigCommon-NB* is used to specify the common NPUSCH configuration. The IE *NPUSCH-ConfigDedicated-NB* is used to specify the UE specific NPUSCH configuration.

*NPUSCH-Config-NB* information element

-- ASN1START

NPUSCH-ConfigCommon-NB-r13 ::= SEQUENCE {

ack-NACK-NumRepetitions-Msg4-r13 SEQUENCE (SIZE(1.. maxNPRACH-Resources-NB-r13)) OF

ACK-NACK-NumRepetitions-NB-r13,

srs-SubframeConfig-r13 ENUMERATED {

sc0, sc1, sc2, sc3, sc4, sc5, sc6, sc7,

sc8, sc9, sc10, sc11, sc12, sc13, sc14, sc15

} OPTIONAL, -- Need OR

dmrs-Config-r13 SEQUENCE {

threeTone-BaseSequence-r13 INTEGER (0..12) OPTIONAL, -- Need OP

threeTone-CyclicShift-r13 INTEGER (0..2),

sixTone-BaseSequence-r13 INTEGER (0..14) OPTIONAL, -- Need OP

sixTone-CyclicShift-r13 INTEGER (0..3),

twelveTone-BaseSequence-r13 INTEGER (0..30) OPTIONAL -- Need OP

} OPTIONAL, -- Need OR

ul-ReferenceSignalsNPUSCH-r13 UL-ReferenceSignalsNPUSCH-NB-r13

}

UL-ReferenceSignalsNPUSCH-NB-r13 ::= SEQUENCE {

groupHoppingEnabled-r13 BOOLEAN,

groupAssignmentNPUSCH-r13 INTEGER (0..29)

}

NPUSCH-ConfigDedicated-NB-r13 ::= SEQUENCE {

ack-NACK-NumRepetitions-r13 ACK-NACK-NumRepetitions-NB-r13 OPTIONAL, -- Need ON

npusch-AllSymbols-r13 BOOLEAN OPTIONAL, -- Cond SRS

groupHoppingDisabled-r13 ENUMERATED {true} OPTIONAL -- Need OR

}

NPUSCH-ConfigDedicated-NB-v16xy ::= SEQUENCE {

npusch-MultiTB-Config-r16 ENUMERATED {interleaved, nonInterleaved}

}

ACK-NACK-NumRepetitions-NB-r13 ::= ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128}

-- ASN1STOP

| *NPUSCH-Config-NB* field descriptions |
| --- |
| ***ack-NACK-NumRepetitions***  Number of repetitions for the ACK NACK resource unit carrying HARQ response to NPDSCH, see TS 36.213 [23], clause 16.4.2. If this field is absentand no value was configured via dedicated signalling, the value used for reception of Msg4 is used. |
| ***ack-NACK-NumRepetitions-Msg4***  Number of repetitions for ACK/NACK HARQ response to NPDSCH containing Msg4 per NPRACH resource, see TS 36.213 [23], clause 16.4.2. |
| ***groupAssignmentNPUSCH***  See TS 36.211 [21], clause 10.1.4.1.3. |
| ***groupHoppingDisabled***  See TS 36.211 [21], clause 10.1.4.1.3. |
| ***groupHoppingEnabled***  See TS 36.211 [21], clause 10.1.4.1.3. |
| ***npusch-AllSymbols***  If set to TRUE, the UE shall use all NB-IoT symbols for NPUSCH transmission. If set to FALSE, the UE punctures the NPUSCH transmissions in the symbols that collides with SRS. If the field is not present, the UE uses all NB-IoT symbols for NPUSCH transmission. See TS 36.211 [21], clause 10.1.3.6. |
| ***npusch-MultiTB-Config***  For FDD: Activation of multiple TBs scheduling in UL, see TS 36.213 [23]. Value *interleaved* indicates that multiple TBs scheduling with interleaved transmission is enabled, value *nonInterleaved* indicates that multiple TBs scheduling without interleaved transmission is enabled. |
| ***sixTone-BaseSequence***  The base sequence of DMRS sequence in a cell for 6 tones transmission; see TS 36.211 [21], clause 10.1.4.1.2. If absent, it is given by NB-IoT CellID mod 14. Value 14 is not used. |
| ***sixTone-CyclicShift***  Define 4 cyclic shifts for the 6-tone case, see TS 36.211 [21], clause 10.1.4.1.2. |
| ***srs-SubframeConfig***  SRS SubframeConfiguration. See TS 36.211 [21], table 5.5.3.3-1. Value sc0 corresponds to value 0, sc1 to value 1 and so on. |
| ***threeTone-BaseSequence***  The base sequence of DMRS sequence in a cell for 3 tones transmission; see TS 36.211 [21], clause 10.1.4.1.2. If absent, it is given by NB-IoT CellID mod 12. Value 12 is not used. |
| ***threeTone-CyclicShift***  Define 3 cyclic shifts for the 3-tone case, see TS 36.211 [21], clause 10.1.4.1.2. |
| ***twelveTone-BaseSequence***  The base sequence of DMRS sequence in a cell for 12 tones transmission; see TS 36.211 [21], clause 10.1.4.1.2. If absent, it is given by NB-IoT CellID mod 30. Value 30 is not used. |
| ***ul-ReferenceSignalsNPUSCH***  Used to specify parameters needed for the transmission on NPUSCH. |

| Conditional presence | Explanation |
| --- | --- |
| *SRS* | This field is optionally present, need OP, if *srs-SubframeConfig* is broadcasted.  Otherwise, the IE is not present. |



#### – *PDCP-Config-NB*

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

*PDCP-Config-NB* information element

-- ASN1START

PDCP-Config-NB-r13 ::= SEQUENCE {

discardTimer-r13 ENUMERATED {

ms5120, ms10240, ms20480, ms40960,

ms81920, infinity, spare2, spare1

} OPTIONAL, -- Cond Setup

headerCompression-r13 CHOICE {

notUsed NULL,

rohc SEQUENCE {

maxCID-r13 INTEGER (1..16383) DEFAULT 15,

profiles-r13 SEQUENCE {

profile0x0002 BOOLEAN,

profile0x0003 BOOLEAN,

profile0x0004 BOOLEAN,

profile0x0006 BOOLEAN,

profile0x0102 BOOLEAN,

profile0x0103 BOOLEAN,

profile0x0104 BOOLEAN

},

...

}

},

...

}

-- ASN1STOP

| *PDCP-Config-NB* field descriptions |
| --- |
| ***discardTimer***  Indicates the discard timer value specified in TS 36.323 [8]. Value in milliseconds. Value ms5120 means 5120 ms, ms10240 means 10240 ms and so on. |
| ***headerCompression***  E-UTRAN does not reconfigure header compression except optionally upon RRC Connection Resumption. |
| ***maxCID***  Indicates the value of the MAX\_CID parameter as specified in TS 36.323 [8]. The total value of MAX\_CIDs across all bearers for the UE should be less than or equal to the value of *maxNumberROHC-ContextSessions* parameter as indicated by the UE. |
| ***profiles***  The profiles used by both compressor and decompressor in both UE and E-UTRAN. The field indicates which of the ROHC profiles specified in TS 36.323 [8] are supported, i.e. value *true* indicates that the profile is supported. Profile 0x0000 shall always be supported when the use of ROHC is configured. If support of two ROHC profile identifiers with the same 8 LSB's is signalled, only the profile corresponding to the highest value shall be applied. |

| **Conditional presence** | **Explanation** |
| --- | --- |
| *Setup* | The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need ON. |

#### – *PhysicalConfigDedicated-NB*

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

*PhysicalConfigDedicated-NB* information element

-- ASN1START

PhysicalConfigDedicated-NB-r13 ::= SEQUENCE {

carrierConfigDedicated-r13 CarrierConfigDedicated-NB-r13 OPTIONAL, -- Need ON

npdcch-ConfigDedicated-r13 NPDCCH-ConfigDedicated-NB-r13 OPTIONAL, -- Need ON

npusch-ConfigDedicated-r13 NPUSCH-ConfigDedicated-NB-r13 OPTIONAL, -- Need ON

uplinkPowerControlDedicated-r13 UplinkPowerControlDedicated-NB-r13 OPTIONAL, -- Need ON

...,

[[ twoHARQ-ProcessesConfig-r14 ENUMERATED {true} OPTIONAL -- Need OR

]],

[[ interferenceRandomisationConfig-r14 ENUMERATED {true} OPTIONAL -- Need OR

]],

[[ npdcch-ConfigDedicated-v1530 NPDCCH-ConfigDedicated-NB-v1530 OPTIONAL -- Cond TDD

]],

[[ additionalTxSIB1-Config-v1540 ENUMERATED {true} OPTIONAL -- Cond additionalSIB1

]],

[[

npusch-ConfigDedicated-v16xy NPUSCH-ConfigDedicated-NB-v16xy OPTIONAL, -- Cond twoHARQ

npdsch-ConfigDedicated-r16 NPDSCH-ConfigDedicated-NB-r16 OPTIONAL,

dl-ResourceReservationConfig-r16 SetupRelease {ResourceReservationConfig-NB-r16} OPTIONAL, -- Cond DL-NR-COEX-NonAnchor

ul-ResourceReservationConfig-r16 SetupRelease {ResourceReservationConfig-NB-r16} OPTIONAL -- Cond UL-NR-COEX-NonAnchor

]]

}

-- ASN1STOP

| *PhysicalConfigDedicated-NB* field descriptions |
| --- |
| ***carrierConfigDedicated***  Anchor/ non-anchor carrier used for all unicast transmissions. |
| ***dl-ResourceReservationConfig***  Configuration of downlink reserved resources for NB-IoT co-existence with NR, see TS 36.211 [21], TS 36.212 [22], and TS 36.213 [22]. |
| ***interferenceRandomisationConfig***  For FDD: Interference randomisation enabled in connected mode, except for random access procedure in connected mode, see TS 36.211 [21]. For random access in connected mode interference randomisation on non-anchor is used and is not used on anchor carrier, see TS 36.211 [21].  For TDD: the parameter is not present. |
| *npdcch-ConfigDedicated*  NPDCCH configuration. |
| ***npusch-ConfigDedicated***  UL unicast configuration. |
| ***twoHARQ-ProcessesConfig***  Activation of two HARQ processes, see TS 36.212 [22] and TS 36.213 [23]. |
| ***ul-ResourceReservationConfig***  Configuration of uplink reserved resources for NB-IoT co-existence with NR, see TS 36.211 [21], TS 36.212 [22], and TS 36.213 [22]. |
| ***uplink-PowerControlDedicated***  UL power control parameter. |
| ***additionalTxSIB1-Config***  Indicates if subframe #3 not containing additional SIB1 transmission is a NB-IoT DL subframe, as specified in TS 36.213 [23], clause 16.4. |

| Conditional presence | Explanation |
| --- | --- |
| *additionalSIB1* | This field is optionally present, Need OR, if *additionalTransmissionSIB1* is set to TRUE in *MasterInformationBlock-NB*; otherwise it is not present. |
| *DL-NR-COEX-NonAnchor* | The field is optionally present, Need ON, for a DL non-anchor carrier deployed within a NR carrier; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *TDD* | The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *twoHARQ* | The field is optionally present, Need OR, if *twoHARQ-ProcessesConfig* is configured; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *UL-NR-COEX-NonAnchor* | The field is optionally present, Need ON, for an UL non-anchor carrier deployed within a NR carrier; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *PUR-Config-NB-r16*

The IE *PUR-Config-NB* is used to specify PUR configuration.

*PUR-Config-NB* information element

-- ASN1START

PUR-Config-NB-r16 ::= SEQUENCE {

pur-TimeAlignmentTimer-r16 INTEGER (1..8) OPTIONAL, --Need OR

pur-NRSRP-ChangeThreshold-r16 SetupRelease {PUR-NRSRP-ChangeThreshold-r16}

OPTIONAL, -- Need ON

pur-ImplicitReleaseAfter-r16 ENUMERATED {n2, n4, n8, spare} OPTIONAL, --Need OR

pur-RNTI-r16 C-RNTI OPTIONAL, --Need ON

pur-ResponseWindowTimer-r16 ENUMERATED {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64}

OPTIONAL, --Need ON

pur-StartTime-r16 ENUMERATED {value1, value2, value3, value4}

OPTIONAL, --Need ON

pur-Periodicity-r16 ENUMERATED {hsf8, hsf16, hsf32, hsf64, hsf128, hsf256,

hsf512, hsf1024, hsf2048, hsf4096, hsf8192,

spare5, spare4, spare3, spare2, spare1}

OPTIONAL, --Need ON

pur-NumOccasions-r16 ENUMERATED {one, infinite},

pur-PhysicalConfig-r16 SEQUENCE {

dl-CarrierConfig-r16 DL-CarrierConfigCommon-NB-r14,

ul-CarrierFreq-r16 CarrierFreq-NB-r13,

npusch-NumRUsIndex-r16 INTEGER (0..7),

npusch-NumRepetitionsIndex-r16 INTEGER (0..7),

npusch-SubCarrierSetIndex-r16 CHOICE {

khz15 INTEGER (0..18),

khz3dot75 INTEGER (0..47)

},

npusch-MCS-r16 CHOICE {

singleTone INTEGER (0..10),

multiTone INTEGER (0..13)

},

uplinkPowerControl-r16-r16 UplinkPowerControlDedicated-NB-r13,

alpha-r16 ENUMERATED {al0, al04, al05, al06,

al07, al08, al09, al1},

npusch-CyclicShift-r16 ENUMERATED {n0, n6},

npdcch-Config-r16 NPDCCH-ConfigDedicated-NB-r13

} OPTIONAL, -- Need ON

...

}

NRSRP-ChangeThresh-NB-r16 ::= ENUMERATED {dB4, dB6, dB8, dB10, dB14, dB18, dB22, dB26, dB30, dB34, spare6, spare5, spare4, spare3, spare2, spare1}

PUR-NRSRP-ChangeThreshold-r16 ::= SEQUENCE {

nrsrp-IncreaseThresh-r16 NRSRP-ChangeThresh-NB-r16,

nrsrp-DecreaseThresh-r16 NRSRP-ChangeThresh-NB-r16 OPTIONAL --Need OP

}

-- ASN1STOP

| *PUR-Config-NB* field descriptions |
| --- |
| ***alpha***  Parameter: *αc*(3). See TS 36.213 [23], clause 16.2.1.1.1. |
| ***dl-CarrierConfig***  Downlink carrier used for PUR. |
| ***npdcch-Config***  NPDCCH configuration for PUR. |
| ***npusch-CyclicShift***  Parameter: . See TS 36.211 [21], clause 10.1.4.1.2. Value *n0* corresponds to value 0 and value *n6* corresponds to value 6. |
| ***npusch-MCS***  This field contains an index to tables specified in TS 36.213 [23], Table 16.5.1.2-1 and Table 16.5.1.2-2 for single tone and multi tone respectively, that defines modulation and TBS index for NPUSCH for PUR. |
| ***npusch-NumRepetitionsIndex***  This field contains an index to a table specified in TS 36.213 [23], Table 16.5.1.1-3, that defines number of repetitions for NPUSCH for PUR. |
| ***npusch-NumRUsIndex***  This field contains an index to a table specified in TS 36.213 [23], Table 16.5.1.1-2, that defines number of resource units for NPUSCH for PUR. |
| ***npusch-SubCarrierSetIndex***  For NPUSCH transmission with subcarrier spacing 3.75 kHz, this field indicates the subcarrier used for PUR specified in TS 36.213 [23].  For NPUSCH transmission with subcarrier spacing 15 kHz, this field contains an index to a table specified in TS 36.213 [23], Table 16.5.1.1-1, that defines the set of subcarriers for NPUSCH for PUR. |
| ***p0-UE-NPUSCH***  Parameter: . See TS 36.213 [23], clause 16.2.1.1, unit dB. |
| ***pur-ImplicitReleaseAfter***  Number of consecutive PUR occasions that can be skipped before implicit release of PUR configuration. Value *n2* corresponds to 2 PUR occasions, value *n4* corresponds to 4 PUR occasions, and so on. |
| ***pur-NRSRP-ChangeThreshold***  Indicates the threshold(s) of change in serving cell RSRP in dB for TA validation. Value *dB4* corresponds to 4 dB, value *dB6* corresponds to 6 dB, and so on. When *nrsrp-ChangeThrsh* is included, if *nrsrp-DecreaseThrsh* is absent the value of *nrsrp-IncreaseThresh* is also used for *nrsrp-DecreaseThresh*. |
| ***pur-NumOccasions***  Number of PUR occasions. Value *one* corresponds to 1 PUR occasion, and value *infinite* corresponds to an infinite number of PUR occasions. |
| ***pur-Periodicity***  Periodicity of PUR resource in number of hyper system frames in TS 36.321 [6].  Value *hsf8* corresponds to 8 hyper system frames, value *hsf16* corresponds to 16 hyper system frames, and so on. |
| ***pur-ResponseWindowTimer***  Duration of the PUR response window in TS 36.321 [6]. Value in PDCCH periods. Value *pp2* corresponds to 2 PDDCH periods, *pp3* corresponds to 3 PDCCH periods, and so on.  The value considered by the UE is: *pur-ResponseWindowSize* = Min (signaled value x PDCCH period, 10.24s). |
| ***pur-RNTI***  PUR-RNTI. |
| ***pur-TimeAlignmentTimer***  Indicates the value of the time alignment timer for PUR. Value in number of *pur-Periodicity*. |
| ***pur-StartTime***  Indicates the value of the time offset for the first PUR occasion, i.e. the time gap from reception of D-PUR configuration to the first PUR occasion. Value FFS. |
| ***ul-CarrierFreq***  UL carrier frequency of the uplink carrier used for PUR as defined in TS 36.101 [42], clause 5.7.3F. |

Editor's Note: Maximum PUR time offset range should be the same as maximum PUR periodicity. FFS further details e.g. how exact PUR start time is configured.

#### – *RACH-ConfigCommon-NB*

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

*RACH-ConfigCommon-NB* information element

-- ASN1START

RACH-ConfigCommon-NB-r13 ::= SEQUENCE {

preambleTransMax-CE-r13 PreambleTransMax,

powerRampingParameters-r13 PowerRampingParameters,

rach-InfoList-r13 RACH-InfoList-NB-r13,

connEstFailOffset-r13 INTEGER (0..15) OPTIONAL, -- Need OP

...,

[[ powerRampingParameters-v1450 PowerRampingParameters-NB-v1450 OPTIONAL -- Need OR

]],

[[ rach-InfoList-v1530 RACH-InfoList-NB-v1530 OPTIONAL -- Cond EDT

]]

}

RACH-InfoList-NB-r13 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF RACH-Info-NB-r13

RACH-InfoList-NB-v1530 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF RACH-Info-NB-v1530

RACH-Info-NB-r13 ::= SEQUENCE {

ra-ResponseWindowSize-r13 ENUMERATED {

pp2, pp3, pp4, pp5, pp6, pp7, pp8, pp10},

mac-ContentionResolutionTimer-r13 ENUMERATED {

pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64}

}

RACH-Info-NB-v1530 ::= SEQUENCE {

mac-ContentionResolutionTimer-r15 ENUMERATED {

pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64}

}

PowerRampingParameters-NB-v1450 ::= SEQUENCE {

preambleInitialReceivedTargetPower-v1450 ENUMERATED {

dBm-130, dBm-128, dBm-126, dBm-124, dBm-122,

dBm-88, dBm-86, dBm-84,dBm-82, dBm-80}

OPTIONAL, -- Need OR

powerRampingParametersCE1-r14 SEQUENCE {

powerRampingStepCE1-r14 ENUMERATED {dB0, dB2, dB4, dB6},

preambleInitialReceivedTargetPowerCE1-r14 ENUMERATED {

dBm-130, dBm-128, dBm-126, dBm-124, dBm-122,

dBm-120, dBm-118, dBm-116, dBm-114, dBm-112,

dBm-110, dBm-108, dBm-106, dBm-104, dBm-102,

dBm-100, dBm-98, dBm-96, dBm-94, dBm-92,

dBm-90, dBm-88, dBm-86, dBm-84, dBm-82, dBm-80}

} OPTIONAL -- Need OR

}

-- ASN1STOP

| *RACH-ConfigCommon-NB* field descriptions |
| --- |
| ***connEstFailOffset***  Parameter "Qoffsettemp" in TS 36.304 [4]. If the field is not present the value of infinity shall be used for "Qoffsettemp". |
| ***mac-ContentionResolutionTimer***  Timer for contention resolution in TS 36.321 [6]. Value in PDCCH periods. Value pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on. *mac-ContentionResolutionTimer-r15* is only applicable for EDT. UE performing EDT shall use *mac-ContentionResolutionTimer-r15*, if present.  For FDD: The value considered by the UE is: *mac-ContentionResolutionTimer* = Min (signaled value x PDCCH period, 10.24s).  For TDD: The value considered by the UE is: *mac-ContentionResolutionTimer* = Min (signaled value x PDCCH period, 20.48s). |
| ***powerRampingParameters, powerRampingParametersCE1***  Power ramping step and preamble initial received target power – same as TS 36.213 [23] and TS 36.321 [6].  For FDD, if the UE does not support enhanced random access power control and more than one repetition level is configured in the cell, then the UE transmits NPRACH with max power except for the lowest repetition level. Otherwise, the UE uses NPRACH power ramping.  For FDD, if the UE supports enhanced random access power control and *powerRampingParameters-v1450* is signalled, or for TDD, the UE uses NPRACH power ramping across repetition levels as specified in TS 36.321 [6]. If *preambleInitialReceivedTargetPower-v1450* is present, the UE shall use *preambleInitialReceivedTargetPower-v1450* instead of *preambleInitialReceivedTargetPower* (i.e. without suffix). If *powerRampingParametersCE1* is present, the UE shall use *powerRampingParametersCE1* instead of *powerRampingParameters* for NPRACH power ramping in the second repetition level. |
| ***preambleTransMax-CE***  Maximum number of preamble transmission in TS 36.321 [6]. Value is an integer. |
| ***ra-ResponseWindowSize***  Duration of the RA response window in TS 36.321 [6]. Value in PDCCH periods. Value pp2 corresponds to 2 PDDCH periods, pp3 corresponds to 3 PDCCH periods and so on.  For FDD: The value considered by the UE is: *ra-ResponseWindowSize* = Min (signaled value x PDCCH period, 10.24s).  For TDD: The value considered by the UE is: *ra-ResponseWindowSize* = Min (signaled value x PDCCH period, 20.48s). |

| Conditional presence | Explanation |
| --- | --- |
| *EDT* | The field is optionally present, Need OR, if *edt-Parameters* is present; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *RadioResourceConfigCommonSIB-NB*

The IE *RadioResourceConfigCommonSIB-NB* is used to specify common radio resource configurations in the system information, e.g., the random access parameters and the static physical layer parameters.

*RadioResourceConfigCommonSIB-NB* information element

-- ASN1START

RadioResourceConfigCommonSIB-NB-r13 ::= SEQUENCE {

rach-ConfigCommon-r13 RACH-ConfigCommon-NB-r13,

bcch-Config-r13 BCCH-Config-NB-r13,

pcch-Config-r13 PCCH-Config-NB-r13,

nprach-Config-r13 NPRACH-ConfigSIB-NB-r13,

npdsch-ConfigCommon-r13 NPDSCH-ConfigCommon-NB-r13,

npusch-ConfigCommon-r13 NPUSCH-ConfigCommon-NB-r13,

dl-Gap-r13 DL-GapConfig-NB-r13 OPTIONAL, -- Need OP

uplinkPowerControlCommon-r13 UplinkPowerControlCommon-NB-r13,

...,

[[ nprach-Config-v1330 NPRACH-ConfigSIB-NB-v1330 OPTIONAL -- Need OR

]],

[[ nprach-Config-v1450 NPRACH-ConfigSIB-NB-v1450 OPTIONAL -- Cond EnhPowerControl

]],

[[ nprach-Config-v1530 NPRACH-ConfigSIB-NB-v1530 OPTIONAL, -- Need OR

dl-Gap-v1530 DL-GapConfig-NB-v1530 OPTIONAL, -- Cond TDD

wus-Config-r15 WUS-Config-NB-r15 OPTIONAL -- Need OR

]],

[[ nprach-Config-v1550 NPRACH-ConfigSIB-NB-v1550 OPTIONAL -- Cond TDD1

]],

[[

gwus-Config-r16 GWUS-Config-NB-r16 OPTIONAL, -- Need OR

nrs-NonAnchorConfig-r16 ENUMERATED {true} OPTIONAL, -- Need OR

ue-SpecificDRX-Allowed-r16 ENUMERATED {true} OPTIONAL -- Need OR

]]

}

BCCH-Config-NB-r13 ::= SEQUENCE {

modificationPeriodCoeff-r13 ENUMERATED {n16, n32, n64, n128}

}

PCCH-Config-NB-r13 ::= SEQUENCE {

defaultPagingCycle-r13 ENUMERATED {rf128, rf256, rf512, rf1024},

nB-r13 ENUMERATED {

fourT, twoT, oneT, halfT, quarterT, one8thT,

one16thT, one32ndT, one64thT,

one128thT, one256thT, one512thT, one1024thT,

spare3, spare2, spare1},

npdcch-NumRepetitionPaging-r13 ENUMERATED {

r1, r2, r4, r8, r16, r32, r64, r128,

r256, r512, r1024, r2048,

spare4, spare3, spare2, spare1}

}

-- ASN1STOP

| *RadioResourceConfigCommonSIB-NB* field descriptions |
| --- |
| ***defaultPagingCycle***  Default paging cycle, used to derive 'T' in TS 36.304 [4]. Value rf128 corresponds to 128 radio frames, rf256 corresponds to 256 radio frames and so on. |
| ***dl-Gap***  Downlink transmission gap configuration for the anchor carrier. See TS 36.211 [21], clause 10.2.3.4. If the field is absent, there is no gap. |
| ***gwus-Config***  For FDD: GWUS Configuration. |
| ***modificationPeriodCoeff***  Actual modification period, expressed in number of radio frames= *modificationPeriodCoeff* \* *defaultPagingCycle*. n16 corresponds to value 16, n32 corresponds to value 32, and so on. The BCCH modification period should be larger or equal to 40.96s. |
| ***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 'T' as defined in TS 36.304 [4]. A value of fourT corresponds to 4 \* T, a value of twoT corresponds to 2 \* T and so on. |
| ***npdcch-NumRepetitionPaging***  Maximum number of repetitions for NPDCCH common search space (CSS) for paging, see TS 36.213 [23], clause 16.6. |
| ***nrs-NonAnchorConfig***  For FDD: This field indicates if NRS are present on non-anchor paging carriers even when no paging NPDCCH is transmitted, see TS 36.211 [21], clause 10.2.6. |
| ***ue-SpecificDRX-Allowed***  This field indicates if the NB-IoT UE is allowed to use UE specific DRX for paging in the cell. |
| ***wus-Config***  For FDD: WUS Configuration. |

| Conditional presence | Explanation |
| --- | --- |
| *EnhPowerControl* | This field is optional present, Need OR, if *PowerRampingParameters-NB-v1450* is included in SIB2-NB. Otherwise the field is not present. |
| *TDD* | The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *TDD1* | The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field. |

#### – *RadioResourceConfigDedicated-NB*

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

*RadioResourceConfigDedicated-NB* information element

-- ASN1START

RadioResourceConfigDedicated-NB-r13 ::= SEQUENCE {

srb-ToAddModList-r13 SRB-ToAddModList-NB-r13 OPTIONAL, -- Need ON

drb-ToAddModList-r13 DRB-ToAddModList-NB-r13 OPTIONAL, -- Need ON

drb-ToReleaseList-r13 DRB-ToReleaseList-NB-r13 OPTIONAL, -- Need ON

mac-MainConfig-r13 CHOICE {

explicitValue-r13 MAC-MainConfig-NB-r13,

defaultValue-r13 NULL

} OPTIONAL, -- Need ON

physicalConfigDedicated-r13 PhysicalConfigDedicated-NB-r13 OPTIONAL, -- Need ON

rlf-TimersAndConstants-r13 RLF-TimersAndConstants-NB-r13 OPTIONAL, -- Need ON

...,

[[ schedulingRequestConfig-r15 SchedulingRequestConfig-NB-r15 OPTIONAL -- Need ON

]]

}

SRB-ToAddModList-NB-r13 ::= SEQUENCE (SIZE (1)) OF SRB-ToAddMod-NB-r13

SRB-ToAddMod-NB-r13 ::= SEQUENCE {

rlc-Config-r13 CHOICE {

explicitValue RLC-Config-NB-r13,

defaultValue NULL

} OPTIONAL, -- Cond Setup

logicalChannelConfig-r13 CHOICE {

explicitValue LogicalChannelConfig-NB-r13,

defaultValue NULL

} OPTIONAL, -- Cond Setup

...,

[[ rlc-Config-v1430 RLC-Config-NB-v1430 OPTIONAL -- Need ON

]]

}

DRB-ToAddModList-NB-r13 ::= SEQUENCE (SIZE (1..maxDRB-NB-r13)) OF DRB-ToAddMod-NB-r13

DRB-ToAddMod-NB-r13 ::= SEQUENCE {

eps-BearerIdentity-r13 INTEGER (0..15) OPTIONAL, -- Cond DRB-Setup-EPC

drb-Identity-r13 DRB-Identity,

pdcp-Config-r13 PDCP-Config-NB-r13 OPTIONAL, -- Cond Setup

rlc-Config-r13 RLC-Config-NB-r13 OPTIONAL, -- Cond Setup

logicalChannelIdentity-r13 INTEGER (3..10) OPTIONAL, -- Cond DRB-Setup

logicalChannelConfig-r13 LogicalChannelConfig-NB-r13 OPTIONAL, -- Cond Setup

...,

[[ rlc-Config-v1430 RLC-Config-NB-v1430 OPTIONAL -- Need ON

]],

[[ pdu-Session-r16 PDU-SessionID-NB-r16 OPTIONAL -- Cond DRB-Setup-5GC

]]

}

PDU-SessionID-NB-r16 ::= INTEGER (0..255)

DRB-ToReleaseList-NB-r13 ::= SEQUENCE (SIZE (1..maxDRB-NB-r13)) OF DRB-Identity

-- ASN1STOP

| *RadioResourceConfigDedicated-NB* field descriptions |
| --- |
| ***logicalChannelConfig***  For SRB 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. |
| ***logicalChannelIdentity***  The logical channel identity for both UL and DL for a DRB. Value 3 is not used. |
| ***mac-MainConfig***  The default MAC MAIN configuration is specified in 9.2.2. |
| ***pdu-Session***  Identity of the PDU session whose QoS flow is mapped to the DRB. |
| ***physicalConfigDedicated***  The default dedicated physical configuration is specified in 9.2.4. |
| ***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. RLC AM is the only applicable RLC mode for SRB1 and SRB1bis. |
| ***schedulingRequestConfig***  For FDD: Scheduling request configuration. |

| **Conditional presence** | **Explanation** |
| --- | --- |
| *DRB-Setup* | The field is mandatory present if the corresponding DRB is being set up; otherwise it is not present. |
| *DRB-Setup-5GC* | The field is mandatory present if the corresponding DRB is being set up when connected to 5GC; otherwise it is not present. |
| *DRB-Setup-EPC* | The field is mandatory present if the corresponding DRB is being set up when connected to EPC; 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. |

#### – *ResourceReservationConfig-NB*

The IE *ResourceReservationConfig-NB* is used to specify the reserved downlink or uplink resources on a NB-IoT carrier, e.g. for deployment within a NR carrier.

*ResourceReservationConfig-NB* information element

-- ASN1START

NR-ResourceReservationConfig-NB-r16::= SEQUENCE {

periodicity-r16 ENUMERATED {ms10, ms20, ms40, ms80, ms160, spare3, spare2,

spare1},

startPosition-r16 INTEGER (0..15),

resourceReservation-r16 CHOICE {

subframeBitmap-r16 CHOICE {

subframePattern10ms BIT STRING (SIZE (10)),

subframePattern40ms BIT STRING (SIZE (40))

},

slotConfig-r16 SEQUENCE {

slotBitmap-r16 CHOICE {

slotPattern10ms BIT STRING (SIZE (20)),

slotPattern40ms BIT STRING (SIZE (80))

},

symbolBitmap-r16 CHOICE {

symbolBitmapFddDl SEQUENCE {

symbolBitmap1 BIT STRING (SIZE (5)) OPTIONAL, -- Cond Bitmap1

symbolBitmap2 BIT STRING (SIZE (5)) OPTIONAL -- Cond Bitmap2

},

symbolBitmapFddUlOrTdd SEQUENCE {

symbolBitmap1 BIT STRING (SIZE (7)) OPTIONAL, -- Cond Bitmap1

symbolBitmap2 BIT STRING (SIZE (7)) OPTIONAL -- Cond Bitmap2

}

}

}

},

...

}

-- ASN1STOP

| *ResourceReservationConfig* field descriptions |
| --- |
| ***periodicity***  Periodicity of the reserved resource. Value *ms10* corresponds to 10 milliseconds, value *ms20* corresponds to 20 milliseconds, and so on. |
| ***slotPattern10ms, slotPattern40ms***  For FDD: Downlink slot-level resource reservation configuration over 10ms or 40ms.  Parameter slot-reserved-resource-config-DL in TS 36.211 [21] and TS 36.213 [23]  The first/leftmost 2-bits corresponds to the subframe #0 of the radio frame satisfying SFN mod x = *startPosition*, where x is the periodicity of the reserved resource divided by 10. Two bits for each subframe coded as:  00: both slots are not reserved  01: the first slot is not reserved, the second slot is reserved  10: the first slot is reserved, the second slot is not reserved  11: both slots are reserved |
| ***startPosition***  Start time of the resource reservation pattern in one period. Unit in multiple of 10 milliseconds.  E-UTRAN configures the value of *startPosition* such as *startPosition \* 10 < periodicity.* |
| ***subframePattern10ms, subframePattern40ms***  For FDD: Downlink subframe-level resource reservation configuration over 10ms or 40ms.  Parameters valid-subframe-config-DL in TS 36.211 [21] and TS 36.213 [23].  The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod x = *startPosition*, where x is the periodicity of the reserved resource divided by 10. Value 0 indicates that the corresponding subframe is not reserved, value 1 indicates that the corresponding subframe is reserved. |
| ***symbolBitmap***  Provides the symbol-level resource reservation for one subframe*.*  E-UTRAN configures *symbolConfigFddDl* for a DL FDD NB-IoT carrier. E-UTRAN configures *symbolConfigFddULOrTdd* for an UL FDD NB-IoT carrier or a TDD NB-IoT carrier. |
| ***symbolBitmap1, symbolBitmap2***  Symbol-level resource reservation over the first or the second slot of one subframe, see TS 36.211 [21].  The first/leftmost bit corresponds to the symbol #0 in the slot. Value 0 indicates that the corresponding symbol is not reserved, value 1 indicates that the corresponding symbol is reserved.  If *symbolBitmap1* is absent, value '01' in the *slotBitmap* corresponds to the second slot being reserved.  If *symbolBitmap2* is absent, value '10' in the *slotBitmap* corresponds to the first slot being reserved. | |
| ***symbolBitmapFddDl***  For FDD: Downlink symbol-level resource reservation over the first and the second slot of one subframe, see TS 36.211 [21].  Symbols that carry NRS are not reserved. |
| ***symbolBitmapFddUlOrTdd***  For FDD: Uplink symbol-level resource reservation over the first and the second slot of one subframe, see TS 36.211 [21].  For TDD: Uplink or downlink symbol-level resource reservation over the first and the second slot of one subframe, see TS 36.211 [21].  Symbols that carry NRS are not reserved. |

| Conditional presence | Explanation | |
| --- | --- | --- |
| *Bitmap1* | The field is optional present, need OR, if *slotBitmap* corresponditing to at least one subrame is '01'; otherwise the field is not present. |
| *Bitmap2* | The field is optional present, need OR, if *slotBitmap* corresponditing to at least one subrame is '10'; otherwise the field is not present. |

#### – *RLC-Config-NB*

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

*RLC-Config-NB information element*

-- ASN1START

RLC-Config-NB-r13 ::= CHOICE {

am SEQUENCE {

ul-AM-RLC-r13 UL-AM-RLC-NB-r13,

dl-AM-RLC-r13 DL-AM-RLC-NB-r13

},

...,

um-Bi-Directional-r15 NULL,

um-Uni-Directional-UL-r15 NULL,

um-Uni-Directional-DL-r15 NULL

}

RLC-Config-NB-v1430 ::= SEQUENCE {

t-Reordering-r14 T-Reordering OPTIONAL -- Cond twoHARQ

}

UL-AM-RLC-NB-r13 ::= SEQUENCE {

t-PollRetransmit-r13 T-PollRetransmit-NB-r13,

maxRetxThreshold-r13 ENUMERATED {t1, t2, t3, t4, t6, t8, t16, t32}

}

DL-AM-RLC-NB-r13 ::= SEQUENCE {

enableStatusReportSN-Gap-r13 ENUMERATED {true} OPTIONAL

}

T-PollRetransmit-NB-r13 ::= ENUMERATED {

ms250, ms500, ms1000, ms2000, ms3000, ms4000,

ms6000, ms10000, ms15000, ms25000, ms40000, ms60000,

ms90000, ms120000, ms180000, ms300000-v1530}

-- ASN1STOP

| *RLC-Config-NB* field descriptions |
| --- |
| ***enableStatusReportSN-Gap***  Indicates that status reporting due to detection of reception failure is enabled, as specified in TS 36.322 [7]. |
| ***maxRetxThreshold***  Parameter for RLC AM in TS 36.322 [7]. Value t1 corresponds to 1 retransmission, t2 to 2 retransmissions and so on. |
| ***t-PollRetransmit***  Timer for RLC AM inTS 36.322 [7], in milliseconds. Value msX means X ms, msY means Y ms and so on.  E-UTRAN may configure the value *msX-v1530* (with suffix) only in TDD mode. |
| ***t-Reordering***  Timer for reordering in TS 36.322 [7], in milliseconds. |

| **Conditional presence** | **Explanation** |
| --- | --- |
| *twoHARQ* | The field is mandatory present if *twoHARQ-ProcessesConfig* is set to TRUE. Otherwise, the field is not present and, if previously configured, the timer is released. |

#### – *RLF-TimersAndConstants-NB*

The IE *RLF-TimersAndConstants-NB* contains UE specific timers and constants applicable for UEs in RRC\_CONNECTED.

*RLF-TimersAndConstants-NB* information element

-- ASN1START

RLF-TimersAndConstants-NB-r13 ::= CHOICE {

release NULL,

setup SEQUENCE {

t301-r13 ENUMERATED {

ms2500, ms4000, ms6000, ms10000,

ms15000, ms25000, ms40000, ms60000},

t310-r13 ENUMERATED {

ms0, ms200, ms500, ms1000, ms2000, ms4000, ms8000},

n310-r13 ENUMERATED {

n1, n2, n3, n4, n6, n8, n10, n20},

t311-r13 ENUMERATED {

ms1000, ms3000, ms5000, ms10000, ms15000,

ms20000, ms30000},

n311-r13 ENUMERATED {

n1, n2, n3, n4, n5, n6, n8, n10},

...,

[[ t311-v1350 ENUMERATED {

ms40000, ms60000, ms90000, ms120000}

OPTIONAL -- Need OR

]],

[[ t301-v1530 ENUMERATED {

ms80000, ms100000, ms120000}

OPTIONAL, -- Cond TDD

t311-v1530 ENUMERATED {

ms160000, ms200000}

OPTIONAL -- Cond TDD

]]

}

}

-- ASN1STOP

| *RLF-TimersAndConstants-NB* field descriptions |
| --- |
| ***n3xy***  Constants are described in clause 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on. |
| ***t3xy***  Timers are described in clause 7.3. Value ms0 corresponds with 0 ms, ms200 corresponds with 200 ms and so on. The UE shall use the extended values *t311-v1350*, *t301-v1530* and *t311-v1530*, if present, and ignore the value signaled by *t311-r13*, *t301-r13* and *t311-r13* respectively. |

|  |  |
| --- | --- |
| Conditional presence | Explanation |
| *TDD* | The field is optionally present, Need OR, in TDD mode. Otherwise, the field is not present. |

#### – *SchedulingRequestConfig-NB*

The IE *SchedulingRequestConfig-NB* is used to specify the Scheduling Request related parameters.

*SchedulingRequestConfig-NB* information element

-- ASN1START

SchedulingRequestConfig-NB-r15 ::= SEQUENCE {

sr-WithHARQ-ACK-Config-r15 ENUMERATED {true} OPTIONAL,

sr-WithoutHARQ-ACK-Config-r15 SR-WithoutHARQ-ACK-Config-NB-r15 OPTIONAL, -- Need ON

sr-SPS-BSR-Config-r15 SR-SPS-BSR-Config-NB-r15 OPTIONAL, -- Need ON

...

}

SR-WithoutHARQ-ACK-Config-NB-r15 ::= CHOICE {

release NULL,

setup SEQUENCE {

sr-ProhibitTimer-r15 INTEGER (0..7) OPTIONAL, -- Need ON

sr-NPRACH-Resource-r15 SR-NPRACH-Resource-NB-r15 OPTIONAL -- Need ON

}

}

SR-NPRACH-Resource-NB-r15 ::= SEQUENCE {

nprach-CarrierIndex-r15 INTEGER (0..maxNonAnchorCarriers-NB-r14),

nprach-ResourceIndex-r15 INTEGER (1..maxNPRACH-Resources-NB-r13),

nprach-SubCarrierIndex-r15 CHOICE {

nprach-Fmt0Fmt1-r15 INTEGER (0..47),

nprach-Fmt2-r15 INTEGER (0..143)

},

p0-SR-r15 INTEGER (-126..24),

alpha-r15 ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1}}

SR-SPS-BSR-Config-NB-r15 ::= CHOICE {

release NULL,

setup SEQUENCE {

semiPersistSchedC-RNTI-r15 C-RNTI,

semiPersistSchedIntervalUL-r15 ENUMERATED {sf128, sf256, sf512, sf1024,

sf1280, sf2048, sf2560, sf5120}

}

}

-- ASN1STOP

| ***SchedulingRequestConfig-NB* field descriptions** |
| --- |
| ***alpha***  Parameter: *αc*. Fractional power control parameter for SR without HARQ-ACK. See TS 36.213 [23], clause 16.2.1.2.1, where value *al0* corresponds to 0, value *al04* corresponds to 0.4, value *al05* to 0.5, value *al06* to 0.6, value *al07* to 0.7, value *al08* to 0.8, value *al09* to 0.9 and value *al1* corresponds to 1. |
| ***nprach-CarrierIndex***  Index of the carrier in the list of UL non anchor carriers in *SystemInformationBlockType22-NB*. The first entry in the list has index '1', the second entry has index '2' and so on. Value '0' indicates the anchor carrier. |
| ***nprach-ResourceIndex***  Index of the NPRACH resource in the list of NPRACH resources in *NPRACH-ParametersList* or *NPRACH-ParametersList-Fmt2* for the UL carrier indicated by *nprach-CarrierIndex*. The first entry in the list has index '1', the second entry has index '2' and so on.  E-UTRAN configures a NPRACH resource in *NPRACH-ParametersList-Fmt2* only to UEs that have reported support of NPRACH resource Format2. |
| ***nprach-SubCarrierIndex***  Index of the subcarrier in the NPRACH resource in *NPRACH-ParametersList* or or *NPRACH-ParametersList-Fmt2* for the indicated UL carrier.  E-UTRAN does not configure *nprach-SubcarrierIndex* to a smaller value than *nprach-SubcarrierOffset* + *nprach-NumCBRA-StartSubcarriers* for the indicated NPRACH resource. |
| ***p0-SR***  Parameter:. Target power for SR without HARQ-ACK. See TS 36.213 [23], clause 16.2.1.2.1, unit dBm. |
| ***semiPersistSchedC-RNTI***  Semi-persistent Scheduling C-RNTI, see TS 36.321 [6]. |
| ***semiPersistSchedIntervalUL***  Semi-persistent scheduling interval in uplink, see TS 36.321 [6]. Value in number of sub-frames. Value *sf128* corresponds to 128 sub-frames, value *sf256* corresponds to 256 sub-frames and so on. |
| ***sr-SPS-BSR-Config***  Activation of SR with SPS BSR, see TS 36.321 [6].  E-UTRAN cannot configure *sr-SPS-BSR* together with *sr-WithoutHARQ-ACK-Config*. |
| ***sr-NPRACH-Resource***  NPRACH resource for physical layer SR without HARQ-ACK, see TS 36.211 [21] and TS 36.213 [23]. |
| ***sr-ProhibitTimer***  Timer for SR transmission on the NPRACH resource for SR in TS 36.321 [6]. Value in number of SR period, where the SR period is equal to the field *nprach-Periodicity* of the NPRACH resource. Value 0 means that behaviour as specified in 7.3.2 applies. Value 1 corresponds to one SR period, Value 2 corresponds to 2\*SR period and so on. |
| ***sr-WithHARQ-ACK-Config***  Activation of physical layer SR with HARQ ACK, see TS 36.213 [23]. |
| ***sr-WithoutHARQ-ACK-Config***  Activation of physical layer SR without HARQ ACK, see TS 36.211 [21] and TS 36.213 [23].  E-UTRAN cannot configure *sr-WithoutHARQ-ACK-Config* together with *sr-SPS-BSR*. |

#### *– TDD-Config-NB*

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

***TDD-Config* information element**

-- ASN1START

TDD-Config-NB-r15 ::= SEQUENCE {

subframeAssignment-r15 ENUMERATED {

sa1, sa2, sa3, sa4, sa5},

specialSubframePatterns-r15 ENUMERATED {

ssp0, ssp1, ssp2, ssp3, ssp4, ssp5, ssp6, ssp7,

ssp8, ssp9, ssp10, ssp10-CRS-LessDwPTS}

}

-- ASN1STOP

| *TDD-Config* field descriptions |
| --- |
| ***specialSubframePatterns***  Indicates Configuration as in TS 36.211 [21], table 4.2-1 where ssp0 points to Configuration 0, ssp1 to Configuration 1 etc. Value *ssp10-CRS-LessDwPTS* corresponds to ssp10 without CRS transmission on the 5th symbol of DwPTS. |
| ***subframeAssignment***  Indicates DL/UL subframe configuration where *sa1* points to Configuration1, *sa2* to Configuration 2 and so on, as specified in TS 36.211 [21], table 4.2-2.  E-UTRAN configures the same value for serving cells residing on same frequency band. |

#### *– TDD-UL-DL-AlignmentOffset-NB*

The IE *TDD-UL-DL-AlignmentOffset-NB* is used to specify the offset between the UL carrier frequency center with respect to DL carrier frequency center. This information should be used to calculate the Mul value, see TS 36.101 [42].

***TDD-UL-DL-AlignmentOffset-NB* information element**

-- ASN1START

TDD-UL-DL-AlignmentOffset-NB-r15 ::= ENUMERATED { khz-7dot5, khz0, khz7dot5}

-- ASN1STOP

#### – *UplinkPowerControl-NB*

The IE *UplinkPowerControlCommon-NB* and IE *UplinkPowerControlDedicated-NB* are used to specify parameters for uplink power control in the system information and in the dedicated signalling, respectively.

*UplinkPowerControl-NB* information elements

-- ASN1START

UplinkPowerControlCommon-NB-r13 ::= SEQUENCE {

p0-NominalNPUSCH-r13 INTEGER (-126..24),

alpha-r13 ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1},

deltaPreambleMsg3-r13 INTEGER (-1..6)

}

UplinkPowerControlDedicated-NB-r13 ::= SEQUENCE {

p0-UE-NPUSCH-r13 INTEGER (-8..7)

}

-- ASN1STOP

| *UplinkPowerControl-NB* field descriptions |
| --- |
| ***alpha***  Parameter: *αc*(1). See TS 36.213 [23], clause 16.2.1.1, 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. |
| ***deltaPreambleMsg3***  Parameter: . See TS 36.213 [23], clause 16.2.1.1. Actual value = IE value \* 2 [dB]. |
| ***p0-NominalNPUSCH***  Parameter: . See TS 36.213 [23], clause 16.2.1.1, unit dBm. |
| ***p0-UE-NPUSCH***  Parameter: . See TS 36.213 [23], clause 16.2.1.1, unit dB. |

#### *– WUS-Config-NB*

The IE *WUS-Config-NB* is used to specify the WUS configuration. For UEs supporting WUS, E-UTRAN uses WUS to indicate that the UE shall attempt to receive paging in that cell, see TS 36.304 [4].

*WUS-Config-NB information element*

-- ASN1START

WUS-Config-NB-r15 ::= SEQUENCE {

maxDurationFactor-r15 WUS-MaxDurationFactor-NB-r15,

numPOs-r15 ENUMERATED {n1, n2, n4} DEFAULT n1,

numDRX-CyclesRelaxed-r15 ENUMERATED {n1, n2, n4, n8},

timeOffsetDRX-r15 ENUMERATED {ms40, ms80, ms160, ms240},

timeOffset-eDRX-Short-r15 ENUMERATED {ms40, ms80, ms160, ms240},

timeOffset-eDRX-Long-r15 ENUMERATED {ms1000, ms2000} OPTIONAL, -- Need OP

...

}

WUS-ConfigPerCarrier-NB-r15 ::= SEQUENCE {

maxDurationFactor-r15 WUS-MaxDurationFactor-NB-r15

}

WUS-MaxDurationFactor-NB-r15 ::= ENUMERATED {one128th, one64th, one32th, one16th,

oneEighth, oneQuarter, oneHalf}

-- ASN1STOP

| *WUS-Config-NB* field descriptions |
| --- |
| ***maxDurationFactor***  Maximum WUS duration, expressed as a ratio of Rmax for Type 1-CSS. Value *one128th* means Rmax \* 1/128, value *one64th* means Rmax \* 1/64 and so on.  The value in TS 36.213 [23] considered by the UE is : maxDuration = Max (signalled value \* Rmax, 1) where Rmax is the value of *npdcch-NumRepetitionPaging* for the carrier. |
| ***numDRX-CyclesRelaxed***  Maximum number of consecutive DRX cycles during which the UE may use WUS for synchronisation and skip serving cell measurements, see TS 36.133 [16]. Value n1 corresponds to 1 DRX cycle, value n2 corresponds to 2 DRX cycles and so on. |
| ***numPOs***  Number of consecutive Paging Occasions (PO) mapped to one Wake Up Signal (WUS), applicable to UEs configured to use extended DRX, see TS 36.304 [4]. Value n1 corresponds to 1 PO and value n2 corresponds to 2 POs and so on. |
| ***timeOffsetDRX***  When DRX is used, non-zero gap from the end of the configured maximum WUS duration to the associated PO, see TS 36.304 [4], clause 7.4 and TS 36.211 [21]. In milliseconds. Value *ms40* corresponds to 40ms, value *ms80* corresponds to 80 ms and so on. |
| ***timeOffset-eDRX-Short***  When eDRX is used, the short non-zero gap from the end of the configured maximum WUS duration to the associated PO, see TS 36.304 [4], clause 7.4 and TS 36.211 [21]. In milliseconds. Value *ms40* corresponds to 40ms, value *ms80* corresponds to 80 ms and so on.  E-UTRAN configures *timeOffset-eDRX-Short* to a value longer than or equal to *timeOffsetDRX*. |
| ***timeOffset-eDRX-Long***  When eDRX is used, the long non-zero gap from the end of the configured maximum WUS duration to the associated PO, see TS 36.304 [4], clause 7.4 and TS 36.211 [21]. In milliseconds. Value *ms1000* corresponds to 1000 ms, value *ms2000* corresponds to 2000 ms. |

#### 6.7.3.3 NB-IoT Security control information elements

Void

#### 6.7.3.4 NB-IoT Mobility control information elements

#### – *AdditionalBandInfoList-NB*

*AdditionalBandInfoList-NB information element*

-- ASN1START

AdditionalBandInfoList-NB-r14 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator-NB-r13

-- ASN1STOP

#### – *FreqBandIndicator-NB*

The IE *FreqBandIndicator-NB* indicates the E-UTRA operating band as defined in TS 36.101 [42], table 5.5-1.

*FreqBandIndicator-NB information element*

-- ASN1START

FreqBandIndicator-NB-r13 ::= INTEGER (1.. maxFBI2)

-- ASN1STOP

#### – *MultiBandInfoList-NB*

*MultiBandInfoList-NB information element*

-- ASN1START

MultiBandInfoList-NB-r13 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF MultiBandInfo-NB-r13

MultiBandInfo-NB-r13 ::= SEQUENCE {

freqBandIndicator-r13 FreqBandIndicator-NB-r13 OPTIONAL, -- Need OR

freqBandInfo-r13 NS-PmaxList-NB-r13 OPTIONAL -- Need OR

}

-- ASN1STOP

#### *– NS-PmaxList-NB*

The IE *NS-PmaxList-NB* concerns a list of *additionalPmax* and *additionalSpectrumEmission* as defined in TS 36.101 [42], clause 6.2.4F, for a given frequency band. E-UTRAN does not include the same value of *additionalSpectrumEmission* in *SystemInformationBlockType2-NB* within this list.

*NS-PmaxList-NB* information element

-- ASN1START

NS-PmaxList-NB-r13 ::= SEQUENCE (SIZE (1..maxNS-Pmax-NB-r13)) OF NS-PmaxValue-NB-r13

NS-PmaxValue-NB-r13 ::= SEQUENCE {

additionalPmax-r13 P-Max OPTIONAL, -- Need OR

additionalSpectrumEmission-r13 AdditionalSpectrumEmission

}

-- ASN1STOP

#### *– ReselectionThreshold-NB*

The IE *ReselectionThreshold-NB* is used to indicate an Rx level threshold for cell reselection. Actual value of threshold = field value \* 2 [dB].

***ReselectionThreshold-NB* information element**

-- ASN1START

ReselectionThreshold-NB-v1360 ::= INTEGER (32..63)

-- ASN1STOP

#### – *T-Reselection-NB*

The IE *T-Reselection-NB* concerns the cell reselection timer TreselectionRAT for NB-IoT.

Value in seconds. s0 means 0 second and behaviour as specified in 7.3.2 applies, s3 means 3 seconds and so on.

*T-Reselection-NB information element*

-- ASN1START

T-Reselection-NB-r13 ::= ENUMERATED {s0, s3, s6, s9, s12, s15, s18, s21}

-- ASN1STOP

#### 6.7.3.5 NB-IoT Measurement information elements

#### – *ANR-MeasConfig-NB*

The IE *ANR-MeasConfig-NB* is used to convey the configuration of the measurements to be performed by the UE in RRC\_IDLE for ANR.

*ANR-MeasConfig-NB* information element

-- ASN1START

ANR-MeasConfig-NB-r16 ::= SEQUENCE {

anr-QualityThreshold-r16 NRSRP-Range-NB-r14,

anr-CarrierList-r16 ANR-CarrierList-NB-r16,

...

}

ANR-CarrierList-NB-r16 ::= SEQUENCE (SIZE (1.. maxFreqANR-NB-r16)) OF ANR-Carrier-NB-r16

ANR-Carrier-NB-r16::= SEQUENCE {

carrierFreqIndex-r16 INTEGER (1.. maxFreq),

blackCellList-r16 ANR-BlackCellList-NB-r16 OPTIONAL, -- Need OP

...

}

ANR-BlackCellList-NB-r16 ::= SEQUENCE (SIZE (1.. maxCellBlack)) OF PhysCellId

-- ASN1STOP

| *ANR-MeasConfig-NB* field descriptions |
| --- |
| ***anr-CarrierList***  List of NB-IoT carriers to be measured for ANR. |
| ***anr-QualityThreshold***  Indicates the quality threshold for reporting the CGI of the strongest cell. |
| ***BlackCellList***  List of blacklisted neighbouring cells for ANR reporting. |
| ***carrierFreqIndex***  Index of the carrier frequency in *interFreqCarrierFreqList* in *SystemInformationBlockType5-NB*. |

#### – *ANR-MeasReport-NB*

The IE *ANR-MeasReport-NB* includes the ANR measurements information.

*ANR-MeasReport-NB* information element

-- ASN1START

ANR-MeasReport-NB-r16 ::= SEQUENCE {

servCellIdentity-r16 CellGlobalIdEUTRA OPTIONAL,

measResultServCell-r16 MeasResultServCell-NB-r14,

measResultList-r16 SEQUENCE (SIZE (1.. maxFreqANR-NB-r16)) OF ANR-MeasResult-NB-r16,

...

}

ANR-MeasResult-NB-r16 ::= SEQUENCE {

carrierFreq-r16 CarrierFreq-NB-r13,

physCellId-r16 PhysCellId OPTIONAL,

measResultLastServCell-r16 MeasResultServCell-NB-R14,

measResult-r16 NRSRP-Range-NB-r14 OPTIONAL,

cgi-Info-r16 SEQUENCE {

cellGlobalId-r16 CellGlobalIdEUTRA,

trackingAreaCode-r16 TrackingAreaCode,

plmn-IdentityList-r16 PLMN-IdentityList2 OPTIONAL

} OPTIONAL

}

-- ASN1STOP

Editor's Note: FFS: Whether a time indication of when the ANR measurements were performed is included in the report, and whether it is a time stamp or a simple indication "immediately after going to IDLE, immediately before going to CONNECTED, in between".

| *ANR-MeasReport-NB* field descriptions |
| --- |
| ***carrierFreq***  Indicates the carrier frequency of the reported cell. |
| ***cgi-info***  Broadcast information of the reported cell. |
| ***measResult***  Measured result of the reported cell. |
| ***measResultList***  List of measured results for the maximum number of reported carrier frequencies. |
| ***measResultLastServCell***  The last measurement results taken in the serving cell when the measured results of the reported cell is stored. |
| ***measResultServingCell***  Measurement results taken in the serving cell when the the configuration of the measurements is received. |
| ***plmn-IdentityList***  The list of PLMN Identity read from the broadcast information of the reported cell. |
| ***ServingCellIdentity***  Indicates the cell where the measurement configuration was received.  If the field is absent, it is the same as the current serving cell. |

#### – *CQI-NPDCCH-NB*

The IE *CQI-NPDCCH-NB* represents the downlink channel quality measurement of the NB-IoT carrier where the random access response is received. The codepoints for the CQI-NPDCCH measurements are according to the mapping table in TS 36.133 [16]. The value *noMeasurements* indicates no measurement reporting.

*CQI-NPDCCH-NB* information element

-- ASN1START

CQI-NPDCCH-NB-r14 ::= ENUMERATED {

noMeasurements, candidateRep-A, candidateRep-B, candidateRep-C,

candidateRep-D, candidateRep-E, candidateRep-F, candidateRep-G,

candidateRep-H, candidateRep-I, candidateRep-J, candidateRep-K,

candidateRep-L}

-- ASN1STOP

#### – *CQI-NPDCCH-Short-NB*

The IE *CQI-NPDCCH-Short-NB* represents the short version of the downlink channel quality measurement of the NB-IoT carrier where the random access response is received. The codepoints for the CQI-NPDCCH-Short measurements are according to the mapping table in TS 36.133 [16]. The value *noMeasurements* indicates no measurement reporting.

*CQI-NPDCCH-Short-NB* information element

-- ASN1START

CQI-NPDCCH-Short-NB-r14 ::= ENUMERATED {

noMeasurements, candidateRep-1, candidateRep-2, candidateRep-3}

-- ASN1STOP

#### – *MeasResultServCell-NB*

The IE *MeasResultServCell-NB* covers the measured results for the serving cell.

*MeasResultServCell-NB* information element

-- ASN1START

MeasResultServCell-NB-r14 ::= SEQUENCE {

nrsrpResult-r14 NRSRP-Range-NB-r14,

nrsrqResult-r14 NRSRQ-Range-NB-r14

}

-- ASN1STOP

#### *– NRSRP-Range-NB*

The IE *NRSRP-Range-NB* specifies the value range used in NRSRP measurements and thresholds. Integer value for NRSRP measurements according to mapping table in TS 36.133 [16], Table 9.1.22.9-1.

***NRSRP-Range-NB* information element**

-- ASN1START

NRSRP-Range-NB-r14 ::= INTEGER(0..113)

-- ASN1STOP

#### *– NRSRQ-Range-NB*

The IE *NRSRQ-Range-NB* specifies the value range used in NRSRQ measurements and thresholds. Integer value for RSRQ measurements is according to mapping table in TS 36.133 [16], Table 9.1.22.14-1. The UE shall not report values 0 and 34.

***NRSRQ-Range-NB* information element**

-- ASN1START

NRSRQ-Range-NB-r14 ::= INTEGER(-30..46)

-- ASN1STOP

#### *– NSSS-RRM-Config-NB*

The IE *NSSS-RRM-Config-NB* provides the configuration for NSSS-based RRM measurements. See TS 36.133 [16], TS 36.211 [21] and TS 36.214 [48]. The UE only perfoms NSSS-based RRM measurement on cells for which the configuration has been provided.

*NSSS-RRM-Config-NB* information element

-- ASN1START

NSSS-RRM-Config-NB-r15 ::= SEQUENCE {

nsss-RRM-PowerOffset-r15 ENUMERATED {dB-3, db0, dB3},

nsss-NumOccDiffPrecoders-r15 ENUMERATED {n1, n2, n4, n8} OPTIONAL -- Need OP

}

-- ASN1STOP

| *NSSS-RRM-Config-NB* field descriptions |
| --- |
| ***nsss-RRM-PowerOffset***  NSSS to NRS ratio for the serving cell as specified in TS 36.214 [48]. Value in dB. Value dB-3 corresponds to -3 dB, dB0 corresponds to 0 dB and so on. |
| ***nsss-NumOccDiffPrecoders***  Number of consecutive NSSS occasions that use different precoders for NSSS transmission.See TS 36.211 [21]. Value *n1* corresponds to 1 occasion, *n2* corresponds to 2 occasions and so on.  For value *n2*, *n4*, and *n8*, UE may assume for *nsss-NumOccDiffPrecoders* consecutive NSSS occasions, E-UTRAN uses different precoders for NSSS transmission. For value *n1*, UE may assume that E-UTRAN always uses the same precoder.  If the field is absent, the UE makes no assumption on the antenna port(s) used for NSSS. |

#### 6.7.3.6 NB-IoT Other information elements

#### – *EstablishmentCause-NB*

The IE *EstablishmentCause-NB* provides the establishment cause for the RRC connection request or the RRC connection resume request as provided by the upper layers.

*EstablishmentCause-NB* informationelement

-- ASN1START

EstablishmentCause-NB-r13 ::= ENUMERATED {

mt-Access, mo-Signalling, mo-Data, mo-ExceptionData,

delayTolerantAccess-v1330, mt-EDT-v16xy, spare2, spare1}

-- ASN1STOP

#### – *UE-Capability-NB*

The IE *UE-Capability-NB* is used to convey the NB-IoT UE Radio Access Capability Parameters, see TS 36.306 [5]. The IE *UE-Capability-NB* is transferred in NB-IoT only.

*UE-Capability-NB* information element

-- ASN1START

UE-Capability-NB-r13 ::= SEQUENCE {

accessStratumRelease-r13 AccessStratumRelease-NB-r13,

ue-Category-NB-r13 ENUMERATED {nb1} OPTIONAL,

multipleDRB-r13 ENUMERATED {supported} OPTIONAL,

pdcp-Parameters-r13 PDCP-Parameters-NB-r13 OPTIONAL,

phyLayerParameters-r13 PhyLayerParameters-NB-r13,

rf-Parameters-r13 RF-Parameters-NB-r13,

dummy SEQUENCE {} OPTIONAL

}

UE-Capability-NB-Ext-r14-IEs ::= SEQUENCE {

ue-Category-NB-r14 ENUMERATED {nb2} OPTIONAL,

mac-Parameters-r14 MAC-Parameters-NB-r14 OPTIONAL,

phyLayerParameters-v1430 PhyLayerParameters-NB-v1430 OPTIONAL,

rf-Parameters-v1430 RF-Parameters-NB-v1430,

nonCriticalExtension UE-Capability-NB-v1440-IEs OPTIONAL

}

UE-Capability-NB-v1440-IEs ::= SEQUENCE {

phyLayerParameters-v1440 PhyLayerParameters-NB-v1440 OPTIONAL,

nonCriticalExtension UE-Capability-NB-v14x0-IEs OPTIONAL

}

UE-Capability-NB-v14x0-IEs ::= SEQUENCE {

-- Following field is only to be used for late REL-14 extensions

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension UE-Capability-NB-v1530-IEs OPTIONAL

}

UE-Capability-NB-v1530-IEs ::= SEQUENCE {

earlyData-UP-r15 ENUMERATED {supported} OPTIONAL,

rlc-Parameters-r15 RLC-Parameters-NB-r15,

mac-Parameters-v1530 MAC-Parameters-NB-v1530,

phyLayerParameters-v1530 PhyLayerParameters-NB-v1530 OPTIONAL,

tdd-UE-Capability-r15 TDD-UE-Capability-NB-r15 OPTIONAL,

nonCriticalExtension UE-Capability-NB-v15x0-IEs OPTIONAL

}

UE-Capability-NB-v15x0-IEs ::= SEQUENCE {

-- Following field is only to be used for late REL-15 extensions

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension UE-Capability-NB-v16xy-IEs OPTIONAL

}

UE-Capability-NB-v16xy-IEs ::= SEQUENCE {

earlySecurityReactivation-r16 ENUMERATED {supported} OPTIONAL,

earlyData-UP-5GC-r16 ENUMERATED {supported} OPTIONAL,

pur-CP-EPC-r16 ENUMERATED {supported} OPTIONAL,

pur-CP-5GC-r16 ENUMERATED {supported} OPTIONAL,

pur-UP-EPC-r16 ENUMERATED {supported} OPTIONAL,

pur-UP-5GC-r16 ENUMERATED {supported} OPTIONAL,

tdd-UE-Capability-v16xy TDD-UE-Capability-NB-v16xy OPTIONAL,

mac-Parameters-v16xy MAC-Parameters-NB-v16xy,

phyLayerParameters-v16xy PhyLayerParameters-NB-v16xy,

son-Parameters-r16 SON-Parameters-NB-r16,

meas-Parameters-r16 Meas-Parameters-NB-r16,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

TDD-UE-Capability-NB-r15 ::= SEQUENCE {

ue-Category-NB-r15 ENUMERATED {nb2} OPTIONAL,

phyLayerParametersRel13-r15 PhyLayerParameters-NB-r13 OPTIONAL,

phyLayerParametersRel14-r15 PhyLayerParameters-NB-v1430 OPTIONAL,

phyLayerParameters-v1530 PhyLayerParameters-NB-v1530 OPTIONAL,

...

}

TDD-UE-Capability-NB-v16xy ::= SEQUENCE {

ul-NR-ResourceReservation-r16 ENUMERATED {supported} OPTIONAL,

dl-NR-ResourceReservation-r16 ENUMERATED {supported} OPTIONAL

}

AccessStratumRelease-NB-r13 ::= ENUMERATED {rel13, rel14, rel15, rel16, spare4, spare3, spare2, spare1, ...}

PDCP-Parameters-NB-r13 ::= SEQUENCE {

supportedROHC-Profiles-r13 SEQUENCE {

profile0x0002 BOOLEAN,

profile0x0003 BOOLEAN,

profile0x0004 BOOLEAN,

profile0x0006 BOOLEAN,

profile0x0102 BOOLEAN,

profile0x0103 BOOLEAN,

profile0x0104 BOOLEAN

},

maxNumberROHC-ContextSessions-r13 ENUMERATED {cs2, cs4, cs8, cs12} DEFAULT cs2,

...

}

RLC-Parameters-NB-r15 ::= SEQUENCE {

rlc-UM-r15 ENUMERATED {supported} OPTIONAL

}

MAC-Parameters-NB-r14 ::= SEQUENCE {

dataInactMon-r14 ENUMERATED {supported} OPTIONAL,

rai-Support-r14 ENUMERATED {supported} OPTIONAL

}

MAC-Parameters-NB-v1530 ::= SEQUENCE {

sr-SPS-BSR-r15 ENUMERATED {supported} OPTIONAL

}

MAC-Parameters-NB-v16xy ::= SEQUENCE {

rai-SupportEnh-r16 ENUMERATED {supported} OPTIONAL

}

Meas-Parameters-NB-r16 ::= SEQUENCE {

dl-ChannelQualityReporting-r16 ENUMERATED {supported} OPTIONAL

}

PhyLayerParameters-NB-r13 ::= SEQUENCE {

multiTone-r13 ENUMERATED {supported} OPTIONAL,

multiCarrier-r13 ENUMERATED {supported} OPTIONAL

}

PhyLayerParameters-NB-v1430 ::= SEQUENCE {

multiCarrier-NPRACH-r14 ENUMERATED {supported} OPTIONAL,

twoHARQ-Processes-r14 ENUMERATED {supported} OPTIONAL

}

PhyLayerParameters-NB-v1440 ::= SEQUENCE {

interferenceRandomisation-r14 ENUMERATED {supported} OPTIONAL

}

PhyLayerParameters-NB-v1530 ::= SEQUENCE {

mixedOperationMode-r15 ENUMERATED {supported} OPTIONAL,

sr-WithHARQ-ACK-r15 ENUMERATED {supported} OPTIONAL,

sr-WithoutHARQ-ACK-r15 ENUMERATED {supported} OPTIONAL,

nprach-Format2-r15 ENUMERATED {supported} OPTIONAL,

additionalTransmissionSIB1-r15 ENUMERATED {supported} OPTIONAL,

npusch-3dot75kHz-SCS-TDD-r15 ENUMERATED {supported} OPTIONAL

}

PhyLayerParameters-NB-v16xy ::= SEQUENCE {

multiTB-UL-r16 ENUMERATED {supported} OPTIONAL,

multiTB-DL-r16 ENUMERATED {supported} OPTIONAL,

multiTB-UL-Interleaving-r16 ENUMERATED {supported} OPTIONAL,

multiTB-DL-Interleaving-r16 ENUMERATED {supported} OPTIONAL,

multiTB-HARQ-ACK-Bundling-r16 ENUMERATED {supported} OPTIONAL,

ul-ResourceReservation-r16 ENUMERATED {supported} OPTIONAL,

dl-ResourceReservation-r16 ENUMERATED {supported} OPTIONAL

}

RF-Parameters-NB-r13 ::= SEQUENCE {

supportedBandList-r13 SupportedBandList-NB-r13,

multiNS-Pmax-r13 ENUMERATED {supported} OPTIONAL

}

RF-Parameters-NB-v1430 ::= SEQUENCE {

powerClassNB-14dBm-r14 ENUMERATED {supported} OPTIONAL

}

SupportedBandList-NB-r13 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBand-NB-r13

SupportedBand-NB-r13 ::= SEQUENCE {

band-r13 FreqBandIndicator-NB-r13,

powerClassNB-20dBm-r13 ENUMERATED {supported} OPTIONAL

}

SON-Parameters-NB-r16 ::= SEQUENCE {

anr-Report-r16 ENUMERATED {supported} OPTIONAL,

rach-Report-r16 ENUMERATED {supported} OPTIONAL

}

-- ASN1STOP

| *UE-Capability-NB* field descriptions | *FDD/TDD appl* | *FDD/TDD diff* |
| --- | --- | --- |
| ***accessStratumRelease***  Set to rel16 in this version of the specification. | FDD/TDD | No |
| ***additionalTransmissionSIB1***  Indicates whether the UE supports additional SIB1 transmission as specified in TS 36.213 [23]. | FDD | - |
| ***anr-Report***  Indicates whether the UE supports ANR measurements in RRC\_IDLE. | FDD/TDD | No |
| ***dataInactMon***  Indicates whether the UE supports the data inactivity monitoring as specified in TS 36.321 [6]. | FDD/TDD | No |
| ***dl-ChannelQualityReporting-r16***  Indicates whether the UE supports DL channel quality reporting in connected mode as specified in TS 36.321 [6]. | FDD | - |
| ***dl-ResourceReservation***  Defines whether the UE supports DL resource reservation for NB-IoT coexistence with NR. | FDD/TDD | Yes |
| ***dummy***  This field is not used in the specification. It shall not be sent by the UE. | NA | NA |
| ***earlyData-UP, earlyData-UP-5GC***  Indicates whether the UE supports EDT for User plane CIoT EPS/5GS optimisations, as defined in TS 24.301 [35] and 24.501 [95] respectively. | FDD | - |
| ***earlySecurityReactivation***  Indicates whether the UE supports early security reactivation when resuming a suspended RRC connection. | FDD/TDD | No |
| ***interferenceRandomisation***  For FDD: Indicates whether the UE supports interference randomisation in connected mode as defined in TS.36.211 [21]. | FDD | - |
| ***maxNumberROHC-ContextSessions***  Set to the maximum number of concurrently active ROHC contexts supported by the UE, excluding context sessions that leave all headers uncompressed. cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on. The network ignores this field if the UE supports none of the ROHC profiles in *supportedROHC-Profiles*. | FDD/TDD | No |
| ***mixedOperationMode***  Defines whether the UE supports multi-carrier operation with mixed operation mode, standalone or inband/guardband, between the anchor carrier and the non-anchor carrier for unicast, paging, and random access as specified in TS 36.300 [9]. | FDD | - |
| ***multiCarrier***  Defines whether the UE supports multi -carrier operation. | FDD/TDD | Yes |
| ***multicarrier-NPRACH***  Defines whether the UE supports NPRACH on non-anchor carrier as specified in TS 36.321 [6]. | FDD/TDD | Yes |
| ***multipleDRB***  Defines whether the UE supports multiple DRBs. | FDD/TDD | No |
| ***multiNS-Pmax***  Defines whether the UE supports the mechanisms defined for NB-IoT cells broadcasting *NS-PmaxList-NB*. | FDD/TDD | No |
| ***multiTB-DL, multiTB-UL***  Defines whether the UE supports multiple TBs scheduling in RRC\_CONNECTED for DL and UL respectively.  If *multiTB-DL* or *multiTB-UL* is included, the UE shall also indicate support for *twoHARQ-Processes*. | FDD | - |
| ***multiTB-DL-Interleaving, multiTB-UL-Interleaving***  Defines whether the UE supports interleaved transmission when multiple TBs is scheduled in RRC\_CONNECTED for DL and UL respectively.  If *multiTB-DL-Interleaving* or *multiTB-UL-Interleaving* is included, the UE shall also indicate support for *multiTB-DL* or *multiTB-UL* respectively. | FDD | - |
| ***multiTB-HARQ-ACK-Bundling***  Defines whether the UE supports HARQ ACK bundling for interleaved transmission for DL.  If *multiTB-HARQ-ACK-Bundling* is included, the UE shall also indicate support for *multiTB-DL-Interleaving*. | FDD | - |
| ***multiTone***  Defines whether the UE supports UL multi-tone transmissions on NPUSCH. | FDD/TDD | Yes |
| ***nprach-Format2***  Defines whether the UE supports NPRACH resources using preamble format 2. | FDD | - |
| ***npusch-3dot75kHz-SCS-TDD***  Indicates whether the UE supports NPUSCH with 3.75kHz SCS for TDD. | TDD | - |
| ***powerClassNB-14dBm***  Defines whether the UE supports power class 14dBm in all the bands supported by the UE as specified in TS 36.101 [42].  If *powerClassNB-20dBm* is included, the UE shall not include the field *powerClassNB-14dBm*. | FDD/TDD | No |
| ***powerClassNB-20dBm***  Defines whether the UE supports power class 20dBm in NB-IoT for the band, as specified in TS 36.101 [42]. If neither *powerClassNB-14dBm* nor *powerClassNB-20dBm* is included, UE supports power class 23 dBm in the NB-IoT band. | FDD/TDD | No |
| ***pur-CP-EPC*, *pur-CP-5GC***  Indicates whether the UE supports transmission using PUR for Control plane CIoT EPS/5GS optimisations, as defined in TS 24.301 [35] and TS 24.501 [95] respectively. | FDD | - |
| ***pur-UP-EPC*, *pur-UP-5GC***  Indicates whether the UE supports transmission using PUR for User plane CIoT EPS/5GS optimisations, as defined in TS 24.301 [35] and TS 24.501 [95] repectively. | FDD | - |
| ***rach-Report***  Indicates whether the UE supports delivery of *rach-Report*. | FDD/TDD | No |
| ***rai-Support***  Defines whether the UE supports release assistance indication (RAI) as specified in TS 36.321 [6]. | FDD/TDD | No |
| ***rai-SupportEnh***  Indicates whether the UE supports 2-bit RAI when connected to EPC as specified in TS 36.321 [6]. | FFS | FFS |
| ***rlc-UM***  Defines whether the UE supports RLC UM as specified in TS 36.322 [7]. | FDD/TDD | No |
| ***supportedBandList***  Includes the supported NB-IoT bands as defined in TS 36.101 [42]. | FDD/TDD | No |
| ***sr-SPS-BSR***  Defines whether the UE supports SR using SPS BSR as specified in TS 36.321 [6]. | FDD | - |
| ***sr-withHARQ-ACK***  Defines whether the UE supports physical layer SR with HARQ ACK as specified in TS 36.213 [23]. | FDD | - |
| ***sr-withoutHARQ-ACK***  Defines whether the UE supports physical layer SR without HARQ ACK as specified in TS 36.211 [21] and TS 36.213 [23]. | FDD | - |
| ***supportedROHC-Profiles***  List of supported ROHC profiles as defined in TS 36.323 [8]. | FDD/TDD | No |
| ***twoHARQ-Processes***  Defines whether the UE supports two HARQ processes operation in DL and UL as specified in TS 36.212 [22] and TS 36.213 [23]. | FDD/TDD | Yes |
| ***ue-Category-NB***  UE category as defined in TS 36.306 [5]. Value nb1 corresponds to UE category NB1, value nb2 corresponds to UE category NB2.  A UE shall always include the field *ue-Category-NB-r13* in this version of the specification. | FDD/TDD | Yes |
| ***ul-ResourceReservation***  Defines whether the UE supports UL resource reservation for NB-IoT coexistence with NR. | FDD/TDD | Yes |

NOTE 1: The IE *UE-Capability-NB* does not include AS security capability information, since these are the same as the security capabilities that are signalled by NAS. Consequently AS need not provide "man-in-the-middle" protection for the security capabilities.

NOTE 2: The column 'FDD/TDD appl' indicates the applicability to the xDD mode: 'FDD' means applicable to FDD only, 'TDD' means applicable to TDD only and 'FDD/TDD' means applicable to FDD and TDD.

NOTE 3: The column 'FDD/TDD diff' indicates if the UE is allowed to signal a different value for FDD and TDD when the capability applies to both FDD and TDD modes. '-' is used when the capability applies to one mode only, 'No' is used for dual mode capabilities where a common value is signalled for both modes, and 'Yes' is used for dual mode capabilities where a separate value is signalled for each mode. Common capabilities and FDD capabilities are reported in the fields of *UE-Capability-NB* except field *tdd-UE-Capability.* TDD capabilities are reported in *tdd-UE-Capability*.

Editor's Note: Working assumption: Introduce two UE capabilities for handling resources reservation on DL or UL in PhyLayerParameters-NB-v16xy.

Editor's Note: Working assumption: Two UE capabilities for handling resources reservation on DL or UL in PhyLayerParameters-NB-v16xy can be applied to both FDD and TDD, e.g., with separate values for FDD or TDD.

#### – *UE-RadioPagingInfo-NB*

The IE *UE-RadioPagingInfo-NB* contains UE NB-IoT capability information needed for paging.

*UE-RadioPagingInfo-NB* information element

-- ASN1START

UE-RadioPagingInfo-NB-r13 ::= SEQUENCE {

ue-Category-NB-r13 ENUMERATED {nb1} OPTIONAL,

...,

[[ multiCarrierPaging-r14 ENUMERATED {true} OPTIONAL

]],

[[ mixedOperationMode-r15 ENUMERATED {supported} OPTIONAL,

wakeUpSignal-r15 ENUMERATED {true} OPTIONAL,

wakeUpSignalMinGap-eDRX-r15 ENUMERATED {ms40, ms240, ms1000, ms2000} OPTIONAL,

multiCarrierPagingTDD-r15 ENUMERATED {true} OPTIONAL

]],

[[ ue-Category-NB-r16 ENUMERATED {nb2} OPTIONAL,

groupWakeUpSignal-r16 ENUMERATED {true} OPTIONAL

]]

}

-- ASN1STOP

Editor's Note: FFS how the use of UE category information is captured in the specifications.

| *UE-RadioPagingInfo-NB field descriptions* |
| --- |
| ***groupWakeUpSignal***  Indicates whether the UE supports GWUS for paging in DRX in FDD as specified in TS 36.211 [21], TS 36.213 [23] and TS 36.304 [4]. If this field is included, the minimum gap between GWUS and associated PO for DRX is fixed as 40 ms. |
| ***mixedOperationMode***  Indicates whether the UE supports multi-carrier operation with mixed operation mode, standalone or inband/guardband, between the anchor carrier and non-anchor carrier for unicast, paging, and random access, as specified in TS 36.300 [9]. |
| ***multiCarrierPaging***  Indicates whether the UE supports paging on non-anchor carriers as defined in TS 36.304 [4]. |
| ***multiCarrierPagingTDD***  Indicates whether the UE supports paging on non-anchor carriers for TDD as defined in TS 36.304 [4]. |
| ***ue-Category-NB***  UE NB-IoT category as defined in TS 36.306 [5]. Value *nb1* corresponds to UE category NB1, value *nb2* corresponds to UE category NB2.  A UE shall always include the field *ue-Category-NB-r13* in this version of the specification. |
| ***wakeUpSignal***  Indicates whether the UE supports WUS for paging in DRX in FDD as specified in TS 36.304 [4]. If this field is included, the minimum gap between WUS and associated PO for DRX is fixed as 40 ms. |
| ***wakeUpSignalMinGap-eDRX***  Indicates the minimum gap the UE supports between WUS or GWUS and associated PO in case of eDRX in FDD, as specified in TS 36.304 [4]. Value *ms40* corresponds to 40 ms, value *ms240* corresponds to 240 ms and so on.  If this field is included, the UE shall also indicate support for WUS or GWUS for paging in DRX. |

#### – *UE-TimersAndConstants-NB*

The IE *UE-TimersAndConstants-NB* contains timers and constants used by the UE in either RRC\_CONNECTED or RRC\_IDLE.

*UE-TimersAndConstants-NB* information element

-- ASN1START

UE-TimersAndConstants-NB-r13 ::= SEQUENCE {

t300-r13 ENUMERATED {

ms2500, ms4000, ms6000, ms10000,

ms15000, ms25000, ms40000, ms60000},

t301-r13 ENUMERATED {

ms2500, ms4000, ms6000, ms10000,

ms15000, ms25000, ms40000, ms60000},

t310-r13 ENUMERATED {

ms0, ms200, ms500, ms1000, ms2000, ms4000, ms8000},

n310-r13 ENUMERATED {

n1, n2, n3, n4, n6, n8, n10, n20},

t311-r13 ENUMERATED {

ms1000, ms3000, ms5000, ms10000, ms15000,

ms20000, ms30000},

n311-r13 ENUMERATED {

n1, n2, n3, n4, n5, n6, n8, n10},

...,

[[ t311-v1350 ENUMERATED {

ms40000, ms60000, ms90000, ms120000}

OPTIONAL -- Need OR

]],

[[ t300-v1530 ENUMERATED {

ms80000, ms100000, ms120000} OPTIONAL, -- Cond TDD

t301-v1530 ENUMERATED {

ms80000, ms100000, ms120000} OPTIONAL, -- Cond TDD

t311-v1530 ENUMERATED {

ms160000, ms200000} OPTIONAL, -- Cond TDD

t300-r15 ENUMERATED {ms6000, ms10000, ms15000, ms25000, ms40000,

ms60000, ms80000, ms120000} OPTIONAL -- Cond EDTorPUR

]]

}

-- ASN1STOP

| *UE-TimersAndConstants-NB* field descriptions |
| --- |
| ***n3xy***  Constants are described in clause 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on. |
| ***t3xy***  Timers are described in clause 7.3. Value ms0 corresponds with 0 ms, ms200 corresponds with 200 ms and so on. The UE shall use the extended values *t311-v1350*, *t300-v1530, t301-v1530 and t311-v1530*, if present, and ignore the value signaled by *t311-r13, t300-r13, t301-r13* and *t311-r13* respectively.  *t300-r15* is only applicable for EDT or transmission using PUR with uplink data. UE performing EDT or transmission using PUR with uplink data shall use *t300-r15*, if present. |

| Conditional presence | Explanation |
| --- | --- |
| *EDTorPUR* | The field is optionally present, Need OR, if *edt-Parameters* or *cp-PUR-5GC* or *cp-PUR-EPC* or *up-PUR-5GC or up-PUR-EPC* is present in SIB2-NB; otherwise the field is not present and the UE shall delete any existing value for this field. |
| *TDD* | The field is optionally present, Need OR, in TDD mode. Otherwise, the field is not present. |

#### 6.7.3.7 NB-IoT MBMS information elements

Void

#### 6.7.3.7a NB-IoT SC-PTM information elements

#### – *SC-MTCH-InfoList-NB*

The IE *SC-MTCH-InfoList-NB* provides the list of ongoing MBMS sessions transmitted via SC-MRB and for each MBMS session, the associated G-RNTI and scheduling information.

*SC-MTCH-InfoList-NB* information element

-- ASN1START

SC-MTCH-InfoList-NB-r14 ::= SEQUENCE (SIZE (0.. maxSC-MTCH-NB-r14)) OF SC-MTCH-Info-NB-r14

SC-MTCH-Info-NB-r14 ::= SEQUENCE {

sc-mtch-CarrierConfig-r14 CHOICE {

dl-CarrierConfig-r14 DL-CarrierConfigCommon-NB-r14,

dl-CarrierIndex-r14 INTEGER (0.. maxNonAnchorCarriers-NB-r14)

},

mbmsSessionInfo-r14 MBMSSessionInfo-r13,

g-RNTI-r14 BIT STRING(SIZE(16)),

sc-mtch-SchedulingInfo-r14 SC-MTCH-SchedulingInfo-NB-r14 OPTIONAL, -- Need OP

sc-mtch-NeighbourCell-r14 BIT STRING (SIZE(maxNeighCell-SCPTM-NB-r14)) OPTIONAL, -- Need OP

npdcch-NPDSCH-MaxTBS-SC-MTCH-r14 ENUMERATED {n680, n2536},

npdcch-NumRepetitions-SC-MTCH-r14 ENUMERATED {r1, r2, r4, r8, r16,

r32, r64, r128, r256,

r512, r1024, r2048, spare4,

spare3, spare2, spare1},

npdcch-StartSF-SC-MTCH-r14 ENUMERATED {v1dot5, v2, v4, v8,

v16, v32, v48, v64},

npdcch-Offset-SC-MTCH-r14 ENUMERATED {zero, oneEighth, oneQuarter,

threeEighth, oneHalf, fiveEighth,

threeQuarter, sevenEighth},

...

}

SC-MTCH-SchedulingInfo-NB-r14 ::= SEQUENCE {

onDurationTimerSCPTM-r14 ENUMERATED {

pp1, pp2, pp3, pp4,

pp8, pp16, pp32, spare},

drx-InactivityTimerSCPTM-r14 ENUMERATED {

pp0, pp1, pp2, pp3,

pp4, pp8, pp16, pp32},

schedulingPeriodStartOffsetSCPTM-r14 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),

sf2048 INTEGER(0..2047),

sf4096 INTEGER(0..4095),

sf8192 INTEGER(0..8191)

},

...

}

-- ASN1STOP

| ***SC-MTCH-InfoList-NB* field descriptions** |
| --- |
| ***dl-CarrierConfig***  Downlink carrier used for SC-MTCH. E-UTRAN cannot configure a downlink carrier operating in mixed operation mode. |
| ***dl-CarrierIndex***  Index to a downlink carrier signalled in system information. Value '0' corresponds to the anchor carrier, value '1' corresponds to the first entry in *dl-ConfigList* in *SystemInformationBlockType22-NB,* value'2' corresponds to the second entry in *dl-ConfigList* and so on. |
| ***drx-InactivityTimerSCPTM***  Timer for SC-MTCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on. |
| ***g-RNTI***  G-RNTI used to scramble the scheduling and transmission of a SC-MTCH. |
| ***mbmsSessionInfo***  Indicates the ongoing MBMS session in a SC-MTCH. |
| ***npdcch-NPDSCH-MaxTBS-SC-MTCH***  Maximum NPDSCH TBS for the SC-MTCH, see TS 36.213 [23]. Value *n680* corresponds to 680 bits and value *n2536* corresponds to 2536 bits. |
| ***npdcch-NumRepetition-SC-MTCH***  The maximum number of NPDCCH repetitions the UE needs to monitor for SC-MTCH multicast search space, see TS 36.213 [23]. |
| ***npdcch-Offset-SC-MTCH***  Fractional period offset of starting subframe for NPDCCH multicast search space for SC-MTCH, see TS 36.213 [23]. |
| ***npdcch-startSF-SC-MTCH***  Starting subframes configuration of the NPDCCH multicast search space for SC-MTCH, see TS 36.213 [23]. |
| ***onDurationTimerSCPTM***  Timer for SC-MTCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on. |
| ***schedulingPeriodStartOffsetSCPTM***  *SCPTM-SchedulingCycle* and *SCPTM-SchedulingOffset* in TS 36.321 [6]. The value of *SCPTM-SchedulingCycle* is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of *SCPTM-SchedulingOffset* is in number of sub-frames. |
| ***sc-mtch-CarrierConfig***  Downlink carrier that is used for SC-MTCH. |
| ***sc-mtch-NeighbourCell***  Indicates neighbour cells which also provide this service on SC-MTCH. The first bit is set to 1 if the service is provided on SC-MTCH in the first cell in *scptmNeighbourCellList*, otherwise it is set to 0. The second bit is set to 1 if the service is provided on SC-MTCH in the second cell in *scptmNeighbourCellList*, and so on. If this field is absent, the UE shall assume that this service is not available on SC-MTCH in any neighbour cell. |
| ***sc-mtch-SchedulingInfo***  DRX information for the SC-MTCH.  If this field is absent, DRX is not used for the SC-MTCH. |

#### – *SCPTM-NeighbourCellList-NB*

The IE *SCPTM-NeighbourCellList-NB* indicates a list of neighbour cells where ongoing MBMS sessions provided via SC-MRB in the current cells are also provided.

-- ASN1START

SCPTM-NeighbourCellList-NB-r14 ::= SEQUENCE (SIZE (1..maxNeighCell-SCPTM-NB-r14)) OF PCI-ARFCN-NB-r14

PCI-ARFCN-NB-r14 ::= SEQUENCE {

physCellId-r14 PhysCellId,

carrierFreq-r14 CarrierFreq-NB-r13 OPTIONAL -- Need OP

}

-- ASN1STOP

| *SCPTM-NeighbourCellList-NB field descriptions* |
| --- |
| ***physCellId***  Physical Cell Identity of the neighbour cell. |
| ***carrierFreq***  Carrier frequency of the neighbour cell.  Absence of the IE means that the neighbour cell is on the same frequency as the current cell. |

### 6.7.4 NB-IoT RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

maxFreqANR-NB-r16 INTEGER ::= 2 -- Maximum number of NB-IOT carrier frequencies that can

-- be configured or reported for ANR measurement

maxFreqEUTRA-NB-r16 INTEGER ::= 8 -- Maximum number of EUTRAN carrier frequencies that can

-- be provided as assistance information for inter-RAT

-- cell selection

maxFreqsGERAN-NB-r16 INTEGER ::= 8 -- Maximum number of groups of GERAN carrier frequencies

-- that can be provided as assistance information for

-- inter-RAT cell selection

maxGWUS-Groups-1-NB-r16 INTEGER ::= 15 -- Maximum number of groups for each paging probability

-- group

maxGWUS-Resources-NB-r16 INTEGER ::= 2 -- Maximum number of GWUS resources for each gap

maxGWUS-ProbThresholds-NB-r16 INTEGER ::= 3 -- Maximum number of paging probability thresholds

maxNPRACH-Resources-NB-r13 INTEGER ::= 3 -- Maximum number of NPRACH resources for NB-IoT

maxNonAnchorCarriers-NB-r14 INTEGER ::= 15 -- Maximum number of non-anchor carriers for NB-IoT

maxDRB-NB-r13 INTEGER ::= 2 -- Maximum number of Data Radio Bearers for NB-IoT

maxNeighCell-SCPTM-NB-r14 INTEGER ::= 8 -- Maximum number of SCPTM neighbour cells

maxNS-Pmax-NB-r13 INTEGER ::= 4 -- Maximum number of NS and P-Max values per band

maxSC-MTCH-NB-r14 INTEGER ::= 64 -- Maximum number of SC-MTCHs in one cell for NB-IoT

maxSI-Message-NB-r13 INTEGER ::= 8 -- Maximum number of SI messages for NB-IoT

-- ASN1STOP

### – End of NBIOT-RRC-Definitions

-- ASN1START

END

-- ASN1STOP

### 6.7.5 Direct Indication Information

Direct Indication information is transmitted on NPDCCH using P-RNTI but without associated *Paging-NB* message. Table 6.7.5-1 defines the Direct Indication information, see TS 36.212 [22], clause 6.4.3.3.

When bit n is set to 1, the UE shall behave as if the corresponding field is set in the *Paging-NB* message, see 5.3.2.3. Bit 1 is the least significant bit.

Table 6.7.5-1: Direct Indication information

|  |  |
| --- | --- |
| **Bit** | Field in *Direct Indication information* |
| 1 | *systemInfoModification* |
| 2 | *systemInfoModification-eDRX* |
| 3, 4, 5, 6, 7, 8 | Not used, and shall be ignored by UE if received |

# 7 Variables and constants

## 7.1 UE variables

NOTE: To facilitate the specification of the UE behavioural requirements, UE variables are represented using ASN.1. Unless explicitly specified otherwise, it is however up to UE implementation how to store the variables. The optionality of the IEs in ASN.1 is used only to indicate that the values may not always be available.

#### – *EUTRA-UE-Variables*

This ASN.1 segment is the start of the E‑UTRA UE variable definitions.

-- ASN1START

EUTRA-UE-Variables DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

AbsoluteTimeInfo-r10,

AreaConfiguration-r10,

AreaConfiguration-v1130,

ARFCN-ValueNR-r15,

BT-NameList-r15,

CarrierFreqGERAN,

CellIdentity,

CellList-r15,

CondReconfigurationToAddModList-r16,

ConnEstFailReport-r11,

EUTRA-CarrierList-r15,

SpeedStateScaleFactors,

C-RNTI,

LoggingDuration-r10,

LoggingInterval-r10,

LogMeasInfo-r10,

MeasCSI-RS-Id-r12,

MeasId,

MeasId-v1250,

MeasIdToAddModList,

MeasIdToAddModListExt-r12,

MeasIdToAddModList-v1310,

MeasIdToAddModListExt-v1310,

MeasObjectToAddModList,

MeasObjectToAddModList-v9e0,

MeasObjectToAddModListExt-r13,

MeasResultListIdle-r15,

MeasResultListIdleNR-r16,

MeasScaleFactor-r12,

MobilityStateParameters,

NeighCellConfig,

NR-CarrierList-r16,

PhysCellId,

PhysCellIdCDMA2000,

PhysCellIdGERAN,

PhysCellIdUTRA-FDD,

PhysCellIdUTRA-TDD,

PLMN-Identity,

PLMN-IdentityList3-r11,

QuantityConfig,

ReportConfigToAddModList,

RLF-Report-r9,

TargetMBSFN-AreaList-r12,

TraceReference-r10,

Tx-ResourcePoolMeasList-r14,

Tx-PoolMeasToAddModListNR-r16,

VisitedCellInfoList-r12,

maxCellMeas,

maxCSI-RS-Meas-r12,

maxMeasId,

maxMeasId-r12,

maxRS-Index-r15,

PhysCellIdNR-r15,

RS-IndexNR-r15,

UL-DelayConfig-r13,

ValidityAreaList-r16,

WLAN-CarrierInfo-r13,

WLAN-Identifiers-r12,

WLAN-Id-List-r13,

WLAN-NameList-r15,

WLAN-Status-r13,

WLAN-Status-v1430,

WLAN-SuspendConfig-r14

FROM EUTRA-RRC-Definitions;

-- ASN1STOP

#### – *VarConditionalReconfiguration*

The UE variable *VarConditionalReconfiguration* includes the accumulated configuration of conditional reconfigurations (i.e. conditional handovers) including the configurations of triggering conditions to be monitored and the stored *RRCConnectionReconfiguration* per target candidate, to be applied upon the fulfilment of the associated triggering conditions.

*VarConditionalReconfiguration* UE variable

-- ASN1START

VarConditionalReconfiguration ::= SEQUENCE {

-- Conditional reconfigurations list

condReconfigurationList-r16 CondReconfigurationToAddModList-r16

OPTIONAL

}

-- ASN1STOP

#### – *VarConnEstFailReport*

The UE variable *VarConnEstFailReport* includes the connection establishment failure information.

*VarConnEstFailReport* UE variable

-- ASN1START

VarConnEstFailReport-r11 ::= SEQUENCE {

connEstFailReport-r11 ConnEstFailReport-r11,

plmn-Identity-r11 PLMN-Identity

}

-- ASN1STOP

#### – *VarLogMeasConfig*

The UE variable *VarLogMeasConfig* includes the configuration of the logging of measurements to be performed by the UE while in RRC\_IDLE, covering intra-frequency, inter-frequency, inter-RAT mobility and MBSFN related measurements. If MBSFN logging is configured, the UE performs logging of measurements while in both RRC\_IDLE and RRC\_CONNECTED. Otherwise, the UE performs logging of measurements only while in RRC\_IDLE.

*VarLogMeasConfig* UE variable

-- ASN1START

VarLogMeasConfig-r10 ::= SEQUENCE {

areaConfiguration-r10 AreaConfiguration-r10 OPTIONAL,

loggingDuration-r10 LoggingDuration-r10,

loggingInterval-r10 LoggingInterval-r10

}

VarLogMeasConfig-r11 ::= SEQUENCE {

areaConfiguration-r10 AreaConfiguration-r10 OPTIONAL,

areaConfiguration-v1130 AreaConfiguration-v1130 OPTIONAL,

loggingDuration-r10 LoggingDuration-r10,

loggingInterval-r10 LoggingInterval-r10

}

VarLogMeasConfig-r12 ::= SEQUENCE {

areaConfiguration-r10 AreaConfiguration-r10 OPTIONAL,

areaConfiguration-v1130 AreaConfiguration-v1130 OPTIONAL,

loggingDuration-r10 LoggingDuration-r10,

loggingInterval-r10 LoggingInterval-r10,

targetMBSFN-AreaList-r12 TargetMBSFN-AreaList-r12 OPTIONAL

}

VarLogMeasConfig-r15 ::= SEQUENCE {

areaConfiguration-r10 AreaConfiguration-r10 OPTIONAL,

areaConfiguration-v1130 AreaConfiguration-v1130 OPTIONAL,

loggingDuration-r10 LoggingDuration-r10,

loggingInterval-r10 LoggingInterval-r10,

targetMBSFN-AreaList-r12 TargetMBSFN-AreaList-r12 OPTIONAL,

bt-NameList-r15 BT-NameList-r15 OPTIONAL,

wlan-NameList-r15 WLAN-NameList-r15 OPTIONAL

}

-- ASN1STOP

#### – *VarLogMeasReport*

The UE variable *VarLogMeasReport* includes the logged measurements information.

*VarLogMeasReport* UE variable

-- ASN1START

VarLogMeasReport-r10 ::= SEQUENCE {

traceReference-r10 TraceReference-r10,

traceRecordingSessionRef-r10 OCTET STRING (SIZE (2)),

tce-Id-r10 OCTET STRING (SIZE (1)),

plmn-Identity-r10 PLMN-Identity,

absoluteTimeInfo-r10 AbsoluteTimeInfo-r10,

logMeasInfoList-r10 LogMeasInfoList2-r10

}

VarLogMeasReport-r11 ::= SEQUENCE {

traceReference-r10 TraceReference-r10,

traceRecordingSessionRef-r10 OCTET STRING (SIZE (2)),

tce-Id-r10 OCTET STRING (SIZE (1)),

plmn-IdentityList-r11 PLMN-IdentityList3-r11,

absoluteTimeInfo-r10 AbsoluteTimeInfo-r10,

logMeasInfoList-r10 LogMeasInfoList2-r10

}

LogMeasInfoList2-r10 ::= SEQUENCE (SIZE (1..maxLogMeas-r10)) OF LogMeasInfo-r10

-- ASN1STOP

#### – *VarMeasConfig*

The UE variable *VarMeasConfig* includes the accumulated configuration of the measurements to be performed by the UE, covering intra-frequency, inter-frequency and inter-RAT mobility related measurements.

NOTE: The amount of measurement configuration information, which a UE is required to store, is specified in clause 11.1. If the number of frequencies configured for a particular RAT exceeds the minimum performance requirements specified in TS 36.133 [16], it is up to UE implementation which frequencies of that RAT are measured. If the total number of frequencies for all RATs provided to the UE in the measurement configuration exceeds the minimum performance requirements specified in TS 36.133 [16], it is up to UE implementation which frequencies/RATs are measured.

*VarMeasConfig* UE variable

-- ASN1START

VarMeasConfig ::= SEQUENCE {

-- Measurement identities

measIdList MeasIdToAddModList OPTIONAL,

measIdListExt-r12 MeasIdToAddModListExt-r12 OPTIONAL,

measIdList-v1310 MeasIdToAddModList-v1310 OPTIONAL,

measIdListExt-v1310 MeasIdToAddModListExt-v1310 OPTIONAL,

-- Measurement objects

measObjectList MeasObjectToAddModList OPTIONAL,

measObjectListExt-r13 MeasObjectToAddModListExt-r13 OPTIONAL,

measObjectList-v9i0 MeasObjectToAddModList-v9e0 OPTIONAL,

-- Reporting configurations

reportConfigList ReportConfigToAddModList OPTIONAL,

-- Other parameters

quantityConfig QuantityConfig OPTIONAL,

measScaleFactor-r12 MeasScaleFactor-r12 OPTIONAL,

s-Measure INTEGER (-140..-44) OPTIONAL,

speedStatePars CHOICE {

release NULL,

setup SEQUENCE {

mobilityStateParameters MobilityStateParameters,

timeToTrigger-SF SpeedStateScaleFactors

}

} OPTIONAL,

allowInterruptions-r11 BOOLEAN OPTIONAL

}

-- ASN1STOP

#### – *VarMeasIdleConfig*

The UE variable *VarMeasIdleConfig* includes the configuration of the measurements to be performed by the UE while in RRC\_IDLE or RRC\_INACTIVE for E-UTRA inter-frequency and inter-RAT (i.e. NR) measurements.

*VarMeasIdleConfig* UE variable

-- ASN1START

VarMeasIdleConfig-r15 ::= SEQUENCE {

measIdleCarrierListEUTRA-r15 EUTRA-CarrierList-r15 OPTIONAL,

measIdleDuration-r15 ENUMERATED {sec10, sec30, sec60, sec120,

sec180, sec240, sec300}

}

VarMeasIdleConfig-r16 ::= SEQUENCE {

measIdleCarrierListNR-r16 NR-CarrierList-r16 OPTIONAL,

validityAreaList-r16 ValidityAreaList-r16 OPTIONAL

}

-- ASN1STOP

#### – *VarMeasIdleReport*

The UE variable *VarMeasIdleReport* includes the logged measurements information.

*VarMeasIdleReport* UE variable

-- ASN1START

VarMeasIdleReport-r15 ::= SEQUENCE {

measReportIdle-r15 MeasResultListIdle-r15

}

VarMeasIdleReport-r16 ::= SEQUENCE {

measReportIdleNR-r16 MeasResultListIdleNR-r16

}

-- ASN1STOP

#### – *VarMeasReportList*

The UE variable *VarMeasReportList* includes information about the measurements for which the triggering conditions have been met.

*VarMeasReportList* UE variable

-- ASN1START

VarMeasReportList ::= SEQUENCE (SIZE (1..maxMeasId)) OF VarMeasReport

VarMeasReportList-r12 ::= SEQUENCE (SIZE (1..maxMeasId-r12)) OF VarMeasReport

VarMeasReport ::= SEQUENCE {

-- List of measurement that have been triggered

measId MeasId,

measId-v1250 MeasId-v1250 OPTIONAL,

cellsTriggeredList CellsTriggeredList OPTIONAL,

csi-RS-TriggeredList-r12 CSI-RS-TriggeredList-r12 OPTIONAL,

poolsTriggeredList-r14 Tx-ResourcePoolMeasList-r14 OPTIONAL,

poolsTriggeredListNR-r16 Tx-PoolMeasToAddModListNR-r16 OPTIONAL,

numberOfReportsSent INTEGER

}

CellsTriggeredList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CHOICE {

physCellIdEUTRA PhysCellId,

physCellIdUTRA CHOICE {

fdd PhysCellIdUTRA-FDD,

tdd PhysCellIdUTRA-TDD

},

physCellIdGERAN SEQUENCE {

carrierFreq CarrierFreqGERAN,

physCellId PhysCellIdGERAN

},

physCellIdCDMA2000 PhysCellIdCDMA2000,

wlan-Identifiers-r13 WLAN-Identifiers-r12,

physCellIdNR-r15 SEQUENCE {

carrierFreq ARFCN-ValueNR-r15,

physCellId PhysCellIdNR-r15,

rs-IndexList-r15 SSB-IndexList-r15 OPTIONAL

}

}

CSI-RS-TriggeredList-r12 ::= SEQUENCE (SIZE (1..maxCSI-RS-Meas-r12)) OF MeasCSI-RS-Id-r12

SSB-IndexList-r15::= SEQUENCE (SIZE (1..maxRS-Index-r15)) OF RS-IndexNR-r15

-- ASN1STOP

#### – *VarMobilityHistoryReport*

The UE variable *VarMobilityHistoryReport* includes the mobility history information.

-- ASN1START

VarMobilityHistoryReport-r12 ::= VisitedCellInfoList-r12

-- ASN1STOP

#### – *VarPendingRnaUpdate*

The UE variable *VarPendingRnaUpdate* indicates whether there is a pending RNAU procedure or not. The setting of this BOOLEAN variable to TRUE means that there is a pending RANU procedure.

*VarPendingRnaUpdate* UE *variable*

-- ASN1START

VarPendingRnaUpdate-r15 ::= SEQUENCE {

pendingRnaUpdate BOOLEAN OPTIONAL

}

-- ASN1STOP

#### – *VarRLF-Report*

The UE variable *VarRLF-Report* includes the radio link failure information or handover failure information.

*VarRLF-Report* UE variable

-- ASN1START

VarRLF-Report-r10 ::= SEQUENCE {

rlf-Report-r10 RLF-Report-r9,

plmn-Identity-r10 PLMN-Identity

}

VarRLF-Report-r11 ::= SEQUENCE {

rlf-Report-r10 RLF-Report-r9,

plmn-IdentityList-r11 PLMN-IdentityList3-r11

}

-- ASN1STOP

#### – *VarShortINACTIVE-MAC-Input*

The UE variable *VarShortINACTIVE-MAC-Input* specifies the input used to generate the *shortResume-MAC-I* during RRC Connection Resume procedure for RRC\_INACTIVE.

*VarShortINACTIVE-MAC-Input* UE variable

-- ASN1START

VarShortINACTIVE*-*MAC-Input-r15 ::= SEQUENCE {

cellIdentity-r15 CellIdentity,

physCellId-r15 PhysCellId,

c-RNTI-r15 C-RNTI

}

-- ASN1STOP

| *VarShortINACTIVE-MAC-Input field descriptions* |
| --- |
| ***cellIdentity***  An input variable used to calculate the *shortResume-MAC-I.* Set to CellIdentity included in *cellIdentity* (without suffix) in SIB1 of the current cell. |
| ***c-RNTI***  Set to C-RNTI that the UE had in the PCell it was connected to prior to suspension of the RRC connection. |
| ***physCellId***  Set to the physical cell identity of the PCell the UE was connected to prior to suspension of the RRC connection. |

#### – *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***  An input variable used to calculate the *shortMAC-I.* Set to CellIdentity included in *cellIdentity* (without suffix) in SIB1 of the current cell. |
| ***c-RNTI***  Set to C-RNTI that the UE had in the PCell it was connected to prior to the failure. |
| ***physCellId***  Set to the physical cell identity of the PCell the UE was connected to prior to the failure. |

#### – *VarShortResumeMAC-Input*

The UE variable *VarShortResumeMAC-Input* specifies the input used to generate the *shortResumeMAC-I* during RRC Connection Resume procedure.

*VarShortResumeMAC-Input* UE variable

-- ASN1START

VarShortResumeMAC-Input-r13 ::= SEQUENCE {

cellIdentity-r13 CellIdentity,

physCellId-r13 PhysCellId,

c-RNTI-r13 C-RNTI,

resumeDiscriminator-r13 BIT STRING(**SIZE(1)**)

}

-- ASN1STOP

| *VarShortResumeMAC-Input field descriptions* |
| --- |
| ***cellIdentity***  An input variable used to calculate the *shortResumeMAC-I.* Set to CellIdentity included in *cellIdentity* (without suffix) in SIB1 of the current cell. |
| ***c-RNTI***  Set to C-RNTI that the UE had in the PCell it was connected to prior to suspension of the RRC connection. |
| ***physCellId***  Set to the physical cell identity of the PCell the UE was connected to prior to suspension of the RRC connection. |
| ***resumeDiscriminator***  A constant that allows differentiation in the calculation of the MAC-I for *shortResumeMAC-I*  The resumeDiscriminator is set to '1' |

#### – *VarWLAN-MobilityConfig*

The UE variable *VarWLAN-MobilityConfig* includes information about WLAN for access selection and mobility.

*VarWLAN-MobilityConfig* UE variable

-- ASN1START

VarWLAN-MobilityConfig ::= SEQUENCE {

wlan-MobilitySet-r13 WLAN-Id-List-r13 OPTIONAL,

successReportRequested ENUMERATED {true} OPTIONAL,

wlan-SuspendConfig-r14 WLAN-SuspendConfig-r14 OPTIONAL

}

-- ASN1STOP

| *VarWLAN-MobilityConfig* field descriptions |
| --- |
| ***wlan-MobilitySet***  Indicates the WLAN mobility set configured. |
| ***successReportRequested***  Indicates whether the UE shall report successful connection to WLAN. Applicable to LWA and LWIP. |

#### – *VarWLAN-Status*

The UE variable *VarWLAN-Status* includes information about the status of WLAN connection for LWA, RCLWI or LWIP.

*VarWLAN-Status* UE variable

-- ASN1START

VarWLAN-Status-r13 ::= SEQUENCE {

status-r13 WLAN-Status-r13,

status-r14 WLAN-Status-v1430 OPTIONAL

}

-- ASN1STOP

| *VarWLAN-Status* field descriptions |
| --- |
| ***status***  Indicates the connection status to WLAN and causes for connection failures. |

#### – Multiplicity and type constraint definitions

This clause includes multiplicity and type constraints applicable (only) for UE variables.

-- ASN1START

maxLogMeas-r10 INTEGER ::= 4060-- Maximum number of logged measurement entries

-- that can be stored by the UE

-- ASN1STOP

#### – End of *EUTRA-UE-Variables*

-- ASN1START

END

-- ASN1STOP

## 7.1a NB-IoT UE variables

NOTE: To facilitate the specification of the UE behavioural requirements, UE variables are represented using ASN.1. Unless explicitly specified otherwise, it is however up to UE implementation how to store the variables. The optionality of the IEs in ASN.1 is used only to indicate that the values may not always be available.

#### – *NBIOT-UE-Variables*

This ASN.1 segment is the start of the NB-IoT UE variable definitions.

-- ASN1START

NBIOT-UE-Variables DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

CellGlobalIdEUTRA,

maxFreq,

PLMN-IdentityList3-r11

FROM EUTRA-RRC-Definitions

VarShortMAC-Input,

VarShortResumeMAC-Input-r13

FROM EUTRA-UE-Variables

ANR-CarrierList-NB-r16,

ANR-MeasResult-NB-r16,

maxFreqANR-NB-r16,

NRSRP-Range-NB-r14,

NRSRQ-Range-NB-r14,

RLF-Report-NB-r16

FROM NBIOT-RRC-Definitions;

-- ASN1STOP

#### – *VarANR-MeasConfig-NB*

The UE variable *VarANR-MeasConfig-NB* includes the configuration of the measurements to be performed by the UE in RRC\_IDLE for ANR. The UE performs these measurements once while in RRC\_IDLE and only in the cell where it receives the measurement configuration.

*VarANR-MeasConfig-NB*

-- ASN1START

VarANR-MeasConfig-NB-r16::= SEQUENCE {

anr-QualityThreshold-r16 NRSRP-Range-NB-r14,

anr-CarrierList-r16 ANR-CarrierList-NB-r16

}

-- ASN1STOP

#### – *VarANR-MeasReport-NB*

The UE variable *VarANR-MeasReport-NB* includes the stored ANR measurements information.

*VarANR-MeasReport-NB*

-- ASN1START

VarANR-MeasReport-NB-r16::= SEQUENCE {

plmn-IdentityList-r16 PLMN-IdentityList3-r11,

servCellIdentity-r16 CellGlobalIdEUTRA,

measResultServCell-r16 MeasResultServCell-NB-r14,

measResultList-r16 SEQUENCE (SIZE (1.. maxFreqANR-NB-r16)) OF ANR-MeasResult-NB-r16

}

-- ASN1STOP

#### – *VarRLF-Report-NB*

The UE variable *VarRLF-Report-NB* includes the radio link failure information.

*VarRLF-Report-NB* UE variable

-- ASN1START

VarRLF-Report-NB-r16 ::= SEQUENCE {

rlf-Report-r16 RLF-Report-NB-r16,

plmn-IdentityList-r16 PLMN-IdentityList3-r11

}

-- ASN1STOP

#### – *VarShortMAC-Input-NB*

The UE variable *VarShortMAC-Input-NB* specifies the input used to generate the shortMAC-I.

*VarShortMAC-Input-NB UE variable*

-- ASN1START

VarShortMAC-Input-NB-r13 ::= VarShortMAC-Input

-- ASN1STOP

#### – *VarShortResumeMAC-Input-NB*

The UE variable *VarShortResumeMAC-Input-NB* specifies the input used to generate the *shortResumeMAC-I* during RRC Connection Resume procedure.

*VarShortResumeMAC-Input-NB UE variable*

-- ASN1START

VarShortResumeMAC-Input-NB-r13 ::= VarShortResumeMAC-Input-r13

-- ASN1STOP

#### – End of *NBIOT-UE-Variables*

-- ASN1START

END

-- ASN1STOP

|  |
| --- |
| Next change |

# 10 Radio information related interactions between network nodes

## 10.1 General

This clause specifies RRC messages that are transferred between network nodes. These RRC messages may be transferred to or from the UE via another Radio Access Technology. Consequently, these messages have similar characteristics as the RRC messages that are transferred across the E-UTRA radio interface, i.e. the same transfer syntax and protocol extension mechanisms apply.

## 10.2 Inter-node RRC messages

### 10.2.1 General

This clause 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,

AntennaInfoDedicated-v10i0,

ARFCN-ValueEUTRA,

ARFCN-ValueEUTRA-v9e0,

ARFCN-ValueEUTRA-r9,

CellIdentity,

C-RNTI,

DL-DCCH-Message,

DRB-Identity,

DRB-ToReleaseList,

DRB-ToReleaseList-r15,

FreqBandIndicator-r11,

InDeviceCoexIndication-r11,

LWA-Config-r13,

MasterInformationBlock,

maxBands,

maxFreq,

maxDRB,

maxDRBExt-r15,

maxDRB-r15,

maxSCell-r10,

maxSCell-r13,

maxServCell-r10,

maxServCell-r13,

MBMSInterestIndication-r11,

MeasConfig,

MeasGapConfig,

MeasGapConfigPerCC-List-r14,

MeasResultForRSSI-r13,

MeasResultListWLAN-r13,

OtherConfig-r9,

PhysCellId,

P-Max,

PowerCoordinationInfo-r12,

SidelinkUEInformation-r12,

SidelinkUEInformationNR-r16,

SL-CommConfig-r12,

SL-DiscConfig-r12,

SubframeAssignment-r15,

RadioResourceConfigDedicated,

RadioResourceConfigDedicated-v13c0,

RadioResourceConfigDedicated-v1370,

RAN-NotificationAreaInfo-r15,

RCLWI-Configuration-r13,

RSRP-Range,

RSRQ-Range,

RSRQ-Range-v1250,

RS-SINR-Range-r13,

SCellToAddModList-r10,

SCellToAddModList-v13c0,

SCellToAddModListExt-r13,

SCellToAddModListExt-v13c0,

SCG-ConfigPartSCG-r12,

SCG-ConfigPartSCG-v12f0,

SCG-ConfigPartSCG-v13c0,

SecurityAlgorithmConfig,

SCellIndex-r10,

SCellIndex-r13,

SCellToReleaseList-r10,

SCellToReleaseListExt-r13,

ServCellIndex-r10,

ServCellIndex-r13,

ShortMAC-I,

MeasResultServFreqListNR-r15,

MeasResultSSTD-r13,

SL-V2X-ConfigDedicated-r14,

SystemInformationBlockType1,

SystemInformationBlockType1-v890-IEs,

SystemInformationBlockType2,

UEAssistanceInformation-r11,

UEAssistanceInformationNR-r16,

UECapabilityInformation,

UE-CapabilityRAT-ContainerList,

UE-RadioPagingInfo-r12,

WLANConnectionStatusReport-r13,

WLAN-OffloadConfig-r12

FROM EUTRA-RRC-Definitions;

-- ASN1STOP

### 10.2.2 Message definitions

#### – *HandoverCommand*

This message is used to transfer the handover command generated by the target eNB.

Direction: target eNB to source eNB/ source RAN

*HandoverCommand* message

-- ASN1START

HandoverCommand ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

handoverCommand-r8 HandoverCommand-r8-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

HandoverCommand-r8-IEs ::= SEQUENCE {

handoverCommandMessage OCTET STRING (CONTAINING DL-DCCH-Message),

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *HandoverCommand* field descriptions |
| --- |
| ***handoverCommandMessage***  Contains the entire DL-DCCH-Message including the *RRCConnectionReconfiguration* message used to perform handover within E-UTRAN or handover to E-UTRAN, generated (entirely) by the target eNB. |

NOTE: The source BSC, in case of inter-RAT handover from GERAN to E-UTRAN, expects that the HandoverCommand message includes DL-DCCH-Message only. Thus, criticalExtensionsFuture, spare1-spare7 and nonCriticalExtension should not be used regardless whether the source RAT is E-UTRAN, UTRAN or GERAN.

#### – *HandoverPreparationInformation*

This message is used to transfer the E-UTRA RRC information used by the target eNB or target ng-eNB during handover preparation or UE context retrieval, e.g. in case of resume or re-establishment, including UE capability information.

Direction: source eNB/ source RAN to target eNB or target ng-eNB

*HandoverPreparationInformation* message

-- ASN1START

HandoverPreparationInformation ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

handoverPreparationInformation-r8 HandoverPreparationInformation-r8-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

HandoverPreparationInformation-r8-IEs ::= SEQUENCE {

ue-RadioAccessCapabilityInfo UE-CapabilityRAT-ContainerList,

as-Config AS-Config OPTIONAL, -- Cond HO

rrm-Config RRM-Config OPTIONAL,

as-Context AS-Context OPTIONAL, -- Cond HO

nonCriticalExtension HandoverPreparationInformation-v920-IEs OPTIONAL

}

HandoverPreparationInformation-v920-IEs ::= SEQUENCE {

ue-ConfigRelease-r9 ENUMERATED {

rel9, rel10, rel11, rel12, v10j0, v11e0,

v1280, rel13, ..., rel14, rel15} OPTIONAL, -- Cond HO2

nonCriticalExtension HandoverPreparationInformation-v9d0-IEs OPTIONAL

}

HandoverPreparationInformation-v9d0-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING (CONTAINING HandoverPreparationInformation-v9j0-IEs) OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-v9e0-IEs OPTIONAL

}

-- Late non-critical extensions:

HandoverPreparationInformation-v9j0-IEs ::= SEQUENCE {

-- Following field is only for pre REL-10 late non-critical extensions

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-v10j0-IEs OPTIONAL

}

HandoverPreparationInformation-v10j0-IEs ::= SEQUENCE {

as-Config-v10j0 AS-Config-v10j0 OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-v10x0-IEs OPTIONAL

}

HandoverPreparationInformation-v10x0-IEs ::= SEQUENCE {

-- Following field is only for late non-critical extensions from REL-10 to REL-12

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-v13c0-IEs OPTIONAL

}

HandoverPreparationInformation-v13c0-IEs ::= SEQUENCE {

as-Config-v13c0 AS-Config-v13c0 OPTIONAL,

-- Following field is only for late non-critical extensions from REL-13

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- Regular non-critical extensions:

HandoverPreparationInformation-v9e0-IEs ::= SEQUENCE {

as-Config-v9e0 AS-Config-v9e0 OPTIONAL, -- Cond HO2

nonCriticalExtension HandoverPreparationInformation-v1130-IEs OPTIONAL

}

HandoverPreparationInformation-v1130-IEs ::= SEQUENCE {

as-Context-v1130 AS-Context-v1130 OPTIONAL, -- Cond HO2

nonCriticalExtension HandoverPreparationInformation-v1250-IEs OPTIONAL

}

HandoverPreparationInformation-v1250-IEs ::= SEQUENCE {

ue-SupportedEARFCN-r12 ARFCN-ValueEUTRA-r9 OPTIONAL, -- Cond HO3

as-Config-v1250 AS-Config-v1250 OPTIONAL, -- Cond HO2

nonCriticalExtension HandoverPreparationInformation-v1320-IEs OPTIONAL

}

HandoverPreparationInformation-v1320-IEs ::= SEQUENCE {

as-Config-v1320 AS-Config-v1320 OPTIONAL, -- Cond HO2

as-Context-v1320 AS-Context-v1320 OPTIONAL, -- Cond HO2

nonCriticalExtension HandoverPreparationInformation-v1430-IEs OPTIONAL

}

HandoverPreparationInformation-v1430-IEs ::= SEQUENCE {

as-Config-v1430 AS-Config-v1430 OPTIONAL, -- Cond HO2

makeBeforeBreakReq-r14 ENUMERATED {true} OPTIONAL, -- Cond HO2

nonCriticalExtension HandoverPreparationInformation-v1530-IEs OPTIONAL

}

HandoverPreparationInformation-v1530-IEs ::= SEQUENCE {

ran-NotificationAreaInfo-r15 RAN-NotificationAreaInfo-r15 OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-v1540-IEs OPTIONAL

}

HandoverPreparationInformation-v1540-IEs ::= SEQUENCE {

sourceRB-ConfigIntra5GC-r15 OCTET STRING OPTIONAL, --Cond HO4

nonCriticalExtension HandoverPreparationInformation-v16xy-IEs OPTIONAL

}

HandoverPreparationInformation-v16xy-IEs ::= SEQUENCE {

as-Context-v16xy AS-Context-v16xy OPTIONAL, --Cond HO5

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *HandoverPreparationInformation* field descriptions |
| --- |
| ***as-Config***  The radio resource configuration. Applicable in case of intra-E-UTRA handover. If the target receives an incomplete *MeasConfig* and/or *RadioResourceConfigDedicated* in the *as-Config*, the target eNB may decide to apply the full configuration option based on the *ue-ConfigRelease*. |
| ***as-Context***  Local E-UTRAN context required by the target eNB. |
| ***makeBeforeBreakReq***  To request the target eNB to add the *makeBeforeBreak* indication in the *mobilityControlInfo* in case of intra-frequency handover. |
| ***rrm-Config***  Local E-UTRAN context used depending on the target node's implementation, which is mainly used for the RRM purpose. May also be provided at inter-RAT handover from NR. |
| ***sourceRB-ConfigIntra5GC***  NR radio bearer config used at intra5GC handover, as defined by *RadioBearerConfig* IE in TS 38.331 [82]. |
| ***ue-ConfigRelease***  Indicates the RRC protocol release or version applicable for the current UE configuration. This could be used by target eNB to decide if the full configuration approach should be used. If this field is not present, the target assumes that the current UE configuration is based on the release 8 version of RRC protocol. NOTE 1. |
| ***ue-RadioAccessCapabilityInfo***  For E-UTRA radio access capabilities, it is up to E-UTRA how the backward compatibility among *supportedBandCombinationReduced*, *supportedBandCombination* and *supportedBandCombinationAdd* is ensured. If *supportedBandCombinationReduced* and *supportedBandCombination*/*supportedBandCombinationAdd* are included into *ueCapabilityRAT-Container*, it can be assumed that the value of fields, *requestedBands*, *reducedIntNonContCombRequested* and *requestedCCsXL* are consistend with all supported band combination fields. NOTE 2 |
| ***ue-SupportedEARFCN***  Includes UE supported EARFCN of the handover target E-UTRA cell if the target E-UTRA cell belongs to multiple frequency bands. |

NOTE 1: The source typically sets the *ue-ConfigRelease* to the release corresponding with the current dedicated radio configuration. The source may however also consider the common radio resource configuration e.g. in case interoperability problems would appear if the UE temporary continues extensions of this part of the configuration in a target PCell not supporting them.

NOTE 2: The following table indicates per source RAT whether RAT capabilities are included or not.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source RAT | E-UTRA capabilites | UTRA capabilities | GERAN capabilities | MR DC capabilities | NR capabilities |
| UTRAN | Included | May be included, ignored by eNB if received | May be included | Excluded | Excluded |
| GERAN CS | Excluded | May be included, ignored by eNB if received | Included | Excluded | Excluded |
| GERAN PS | Excluded | May be included, ignored by eNB if received | Included | Excluded | Excluded |
| E-UTRAN | Included | May be included | May be included | May be included | May be included |
| NR | Included | Excluded | Excluded | May be included | May be included |

| Conditional presence | Explanation |
| --- | --- |
| *HO* | The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present. |
| *HO2* | The field is optional present in case of handover within E-UTRA; otherwise the field is not present. |
| *HO3* | The field is optional present in case of handover from GERAN to E-UTRA, otherwise the field is not present. |
| *HO4* | The field is mandatory present in case of handover within E-UTRA/5GC and optional present in case of handover from NR to E-UTRA/5GC; otherwise the field is not present. |
| *HO5* | The field is optional present in case of handover within E-UTRA, or handover from NR to E-UTRA; otherwise the field is not present. |

#### – *SCG-Config*

This message is used to transfer the SCG radio configuration generated by the SeNB.

Direction: Secondary eNB to master eNB

*SCG-Config* message

-- ASN1START

SCG-Config-r12 ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

scg-Config-r12 SCG-Config-r12-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

SCG-Config-r12-IEs ::= SEQUENCE {

scg-RadioConfig-r12 SCG-ConfigPartSCG-r12 OPTIONAL,

nonCriticalExtension SCG-Config-v12i0a-IEs OPTIONAL

}

SCG-Config-v12i0a-IEs ::= SEQUENCE {

-- Following field is only for late non-critical extensions from REL-12

lateNonCriticalExtension OCTET STRING (CONTAINING SCG-Config-v12i0b-IEs) OPTIONAL,

nonCriticalExtension SCG-Config-v13c0-IEs OPTIONAL

}

SCG-Config-v12i0b-IEs ::= SEQUENCE {

scg-RadioConfig-v12i0 SCG-ConfigPartSCG-v12f0 OPTIONAL, -- Need ON

nonCriticalExtension SEQUENCE {} OPTIONAL

}

SCG-Config-v13c0-IEs ::= SEQUENCE {

scg-RadioConfig-v13c0 SCG-ConfigPartSCG-v13c0 OPTIONAL,

-- Following field is only for late non-critical extensions from REL-13 onwards

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *SCG-Config* field descriptions |
| --- |
| ***scg-RadioConfig-r12***  Includes the change of the dedicated SCG configuration and, upon addition of an SCG cell, the common SCG configuration.  The SeNB only includes a new SCG cell in response to a request from MeNB, but may include release of an SCG cell release or release of the SCG part of an SCG/Split DRB without prior request from MeNB. The SeNB does not use this field to initiate release of the SCG. |

#### – *SCG-ConfigInfo*

This message is used by MeNB to request the SeNB to perform certain actions e.g. to establish, modify or release an SCG, and it may include additional information e.g. to assist the SeNB with assigning the SCG configuration.

Direction: Master eNB to secondary eNB

*SCG-ConfigInfo* message

-- ASN1START

SCG-ConfigInfo-r12 ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

scg-ConfigInfo-r12 SCG-ConfigInfo-r12-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

SCG-ConfigInfo-r12-IEs ::= SEQUENCE {

radioResourceConfigDedMCG-r12 RadioResourceConfigDedicated OPTIONAL,

sCellToAddModListMCG-r12 SCellToAddModList-r10 OPTIONAL,

measGapConfig-r12 MeasGapConfig OPTIONAL,

powerCoordinationInfo-r12 PowerCoordinationInfo-r12 OPTIONAL,

scg-RadioConfig-r12 SCG-ConfigPartSCG-r12 OPTIONAL,

eutra-CapabilityInfo-r12 OCTET STRING (CONTAINING UECapabilityInformation) OPTIONAL,

scg-ConfigRestrictInfo-r12 SCG-ConfigRestrictInfo-r12 OPTIONAL,

mbmsInterestIndication-r12 OCTET STRING (CONTAINING

MBMSInterestIndication-r11) OPTIONAL,

measResultServCellListSCG-r12 MeasResultServCellListSCG-r12 OPTIONAL,

drb-ToAddModListSCG-r12 DRB-InfoListSCG-r12 OPTIONAL,

drb-ToReleaseListSCG-r12 DRB-ToReleaseList OPTIONAL,

sCellToAddModListSCG-r12 SCellToAddModListSCG-r12 OPTIONAL,

sCellToReleaseListSCG-r12 SCellToReleaseList-r10 OPTIONAL,

p-Max-r12 P-Max OPTIONAL,

nonCriticalExtension SCG-ConfigInfo-v1310-IEs OPTIONAL

}

SCG-ConfigInfo-v1310-IEs ::= SEQUENCE {

measResultSSTD-r13 MeasResultSSTD-r13 OPTIONAL,

sCellToAddModListMCG-Ext-r13 SCellToAddModListExt-r13 OPTIONAL,

measResultServCellListSCG-Ext-r13 MeasResultServCellListSCG-Ext-r13 OPTIONAL,

sCellToAddModListSCG-Ext-r13 SCellToAddModListSCG-Ext-r13 OPTIONAL,

sCellToReleaseListSCG-Ext-r13 SCellToReleaseListExt-r13 OPTIONAL,

nonCriticalExtension SCG-ConfigInfo-v1330-IEs OPTIONAL

}

SCG-ConfigInfo-v1330-IEs ::= SEQUENCE {

measResultListRSSI-SCG-r13 MeasResultListRSSI-SCG-r13 OPTIONAL,

nonCriticalExtension SCG-ConfigInfo-v1430-IEs OPTIONAL

}

SCG-ConfigInfo-v1430-IEs ::= SEQUENCE {

makeBeforeBreakSCG-Req-r14 ENUMERATED {true} OPTIONAL,

measGapConfigPerCC-List MeasGapConfigPerCC-List-r14 OPTIONAL,

nonCriticalExtension SCG-ConfigInfo-v1530-IEs OPTIONAL

}

SCG-ConfigInfo-v1530-IEs ::= SEQUENCE {

drb-ToAddModListSCG-r15 DRB-InfoListSCG-r15 OPTIONAL,

drb-ToReleaseListSCG-r15 DRB-ToReleaseList-r15 OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

DRB-InfoListSCG-r12 ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-InfoSCG-r12

DRB-InfoListSCG-r15 ::= SEQUENCE (SIZE (1..maxDRB-r15)) OF DRB-InfoSCG-r12

DRB-InfoSCG-r12 ::= SEQUENCE {

eps-BearerIdentity-r12 INTEGER (0..15) OPTIONAL, -- Cond DRB-Setup

drb-Identity-r12 DRB-Identity,

drb-Type-r12 ENUMERATED {split, scg} OPTIONAL, -- Cond DRB-Setup

...

}

SCellToAddModListSCG-r12 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF Cell-ToAddMod-r12

SCellToAddModListSCG-Ext-r13 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF Cell-ToAddMod-r12

Cell-ToAddMod-r12 ::= SEQUENCE {

sCellIndex-r12 SCellIndex-r10,

cellIdentification-r12 SEQUENCE {

physCellId-r12 PhysCellId,

dl-CarrierFreq-r12 ARFCN-ValueEUTRA-r9

} OPTIONAL, -- Cond SCellAdd

measResultCellToAdd-r12 SEQUENCE {

rsrpResult-r12 RSRP-Range,

rsrqResult-r12 RSRQ-Range

} OPTIONAL, -- Cond SCellAdd2

...,

[[ sCellIndex-r13 SCellIndex-r13 OPTIONAL,

measResultCellToAdd-v1310 SEQUENCE {

rs-sinr-Result-r13 RS-SINR-Range-r13

} OPTIONAL -- Cond SCellAdd2

]]

}

MeasResultServCellListSCG-r12 ::= SEQUENCE (SIZE (1..maxServCell-r10)) OF MeasResultServCellSCG-r12

MeasResultServCellListSCG-Ext-r13 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasResultServCellSCG-r12

MeasResultServCellSCG-r12 ::= SEQUENCE {

servCellId-r12 ServCellIndex-r10,

measResultSCell-r12 SEQUENCE {

rsrpResultSCell-r12 RSRP-Range,

rsrqResultSCell-r12 RSRQ-Range

},

...,

[[ servCellId-r13 ServCellIndex-r13 OPTIONAL,

measResultSCell-v1310 SEQUENCE {

rs-sinr-ResultSCell-r13 RS-SINR-Range-r13

} OPTIONAL

]]

}

MeasResultListRSSI-SCG-r13 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasResultRSSI-SCG-r13

MeasResultRSSI-SCG-r13 ::= SEQUENCE {

servCellId-r13 ServCellIndex-r13,

measResultForRSSI-r13 MeasResultForRSSI-r13

}

SCG-ConfigRestrictInfo-r12 ::= SEQUENCE {

maxSCH-TB-BitsDL-r12 INTEGER (1..100),

maxSCH-TB-BitsUL-r12 INTEGER (1..100)

}

-- ASN1STOP

| *SCG-ConfigInfo* field descriptions |
| --- |
| ***drb-ToAddModListSCG***  Includes DRBs the SeNB is requested to establish or modify (DRB type change). |
| ***drb-ToReleaseListSCG***  Includes DRBs the SeNB is requested to release. |
| ***makeBeforeBreakSCG-Req***  To request the target eNB to add the *makeBeforeBreakSCG* indication in the *mobilityControlInfoSCG* in case of intra-frequency SCG change. |
| ***maxSCH-TB-BitsXL***  Indicates the maximum DL-SCH/UL-SCH TB bits that may be scheduled in a TTI. Specified as a percentage of the value defined for the applicable UE category. |
| ***measGapConfig***  Includes the current measurement gap configuration. |
| ***measResultListRSSI-SCG***  Includes RSSI measurement results of SCG (serving) cells |
| ***measResultSSTD***  Includes measurement results of UE SFN and Subframe Timing Difference between the PCell and the PSCell. |
| ***measResultServCellListSCG***  Includes measurement results of SCG (serving) cells. |
| ***radioResourceConfigDedMCG***  Includes the current dedicated MCG radio resource configuration. |
| ***sCellIndex***  If sCellIndex-r13 is present, sCellIndex-r12 shall be ignored. |
| ***sCellToAddModListMCG, sCellToAddModListMCG-Ext***  Includes the current MCG SCell configuration. Field *sCellToAddModListMCG* is used to add the first 4 SCells with *sCellIndex-r10* while *sCellToAddModListMCG-Ext* is used to add the rest. |
| ***sCellToAddModListSCG, sCellToAddModListSCG-Ext***  Includes SCG cells the SeNB is requested to establish. Measurement results may be provided for these cells. Field *sCellToAddModListSCG* is used to add the first 4 SCells with *sCellIndex-r12* while *sCellToAddModListSCG-Ext* is used to add the rest. |
| ***sCellToReleaseListSCG, sCellToReleaseListSCG-Ext***  Includes SCG cells the SeNB is requested to release. |
| ***scg-RadioConfig***  Includes the current dedicated SCG configuration. |
| ***scg-ConfigRestrictInfo***  Includes fields for which MeNB explictly indicates the restriction to be observed by SeNB. |
| ***servCellId***  If servCellId-r13 is present, servCellId-r12 shall be ignored. |
| ***p-Max***  Cell specific value i.e. as broadcast by PCell. |

| Conditional presence | Explanation |
| --- | --- |
| *DRB-Setup* | The field is mandatory present in case DRB establishment is requested; otherwise the field is not present. |
| *SCellAdd* | The field is mandatory present in case SCG cell establishment is requested; otherwise the field is not present. |
| *SCellAdd2* | The field is optional present in case SCG cell establishment is requested; otherwise the field is not present. |

#### – *UEPagingCoverageInformation*

This message is used to transfer UE paging coverage information, covering both upload to and download from the EPC.

Direction: eNB to/from EPC

*UEPagingCoverageInformation* message

-- ASN1START

UEPagingCoverageInformation ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

uePagingCoverageInformation-r13 UEPagingCoverageInformation-r13-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UEPagingCoverageInformation-r13-IEs ::= SEQUENCE {

mpdcch-NumRepetition-r13 INTEGER (1..256) OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UEPagingCoverageInformation* field descriptions |
| --- |
| ***mpdcch-NumRepetition***  Number of repetitions for MPDCCH. The value is an estimate of the required number of repetitions for MPDCCH for paging. |

#### – *UERadioAccessCapabilityInformation*

This message is used to transfer UE radio access capability information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

*UERadioAccessCapabilityInformation* message

-- ASN1START

UERadioAccessCapabilityInformation ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

ueRadioAccessCapabilityInformation-r8

UERadioAccessCapabilityInformation-r8-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UERadioAccessCapabilityInformation-r8-IEs ::= SEQUENCE {

ue-RadioAccessCapabilityInfo OCTET STRING (CONTAINING UECapabilityInformation),

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UERadioAccessCapabilityInformation* field descriptions |
| --- |
| ***ue-RadioAccessCapabilityInfo***  Including E-UTRA, GERAN, CDMA2000-1xRTT Bandclass, NR and MR-DC radio access capabilities (separated). UTRA radio access capabilities are not included. For E-UTRA radio access capabilities, it is up to E-UTRA how the backward compatibility among *supportedBandCombinationReduced*, *supportedBandCombination* and *supportedBandCombinationAdd* is ensured. If *supportedBandCombinationReduced* and *supportedBandCombination*/*supportedBandCombinationAdd* are included into *ueCapabilityRAT-Container*, it can be assumed that the value of fields, *requestedBands*, *reducedIntNonContCombRequested* and *requestedCCsXL* are consistent with all supported band combination fields. |

#### – *UERadioPagingInformation*

This message is used to transfer radio paging information, covering both upload to and download from the EPC/5GC.

Direction: eNB to/ from EPC/5GC

*UERadioPagingInformation* message

-- ASN1START

UERadioPagingInformation ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

ueRadioPagingInformation-r12 UERadioPagingInformation-r12-IEs,

spare7 NULL,

spare6 NULL, spare5 NULL, spare4 NULL,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UERadioPagingInformation-r12-IEs ::= SEQUENCE {

ue-RadioPagingInfo-r12 OCTET STRING (CONTAINING UE-RadioPagingInfo-r12),

nonCriticalExtension UERadioPagingInformation-v1310-IEs OPTIONAL

}

UERadioPagingInformation-v1310-IEs ::= SEQUENCE {

supportedBandListEUTRAForPaging-r13 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicator-r11 OPTIONAL,

nonCriticalExtension UERadioPagingInformation-v16xy-IEs OPTIONAL

}

UERadioPagingInformation-v16xy-IEs ::= SEQUENCE {

accessStratumRelease-r16 ENUMERATED {true} OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UERadioPagingInformation* field descriptions |
| --- |
| ***accessStratumRelease***  Indicates that the UE supports reception of *accessType-r16* in the Paging message. |
| ***supportedBandListEUTRAForPaging***  Indicates the UE supported frequency bands which is derived by the eNB from *UE-EUTRA-Capability*. |
| ***ue-RadioPagingInfo***  The field is used to transfer UE capability information used for paging. The eNB generates the *ue-RadioPagingInfo* andthe contained UE capability information is absent when not supported by the UE. |

## 10.3 Inter-node RRC information element definitions

#### – *AS-Config*

The *AS-Config* IE contains information about RRC configuration information in the source eNB which can be utilized by target eNB 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 or resume.

*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

-- sourceOtherConfig-r9 should have been optional. A target eNB compliant with this transfer

-- syntax should support receiving an AS-Config not including this extension addition group

-- e.g. from a legacy source eNB

]],

[[ sourceSCellConfigList-r10 SCellToAddModList-r10 OPTIONAL

]],

[[ sourceConfigSCG-r12 SCG-Config-r12 OPTIONAL

]],

[[ as-ConfigNR-r15 AS-ConfigNR-r15 OPTIONAL

]],

[[ as-Config-v1550 AS-Config-v1550 OPTIONAL

]],

[[ as-ConfigNR-v1570 AS-ConfigNR-v1570 OPTIONAL

]]

}

AS-Config-v9e0 ::= SEQUENCE {

sourceDl-CarrierFreq-v9e0 ARFCN-ValueEUTRA-v9e0

}

AS-Config-v10j0 ::= SEQUENCE {

antennaInfoDedicatedPCell-v10i0 AntennaInfoDedicated-v10i0 OPTIONAL

}

AS-Config-v1250 ::= SEQUENCE {

sourceWlan-OffloadConfig-r12 WLAN-OffloadConfig-r12 OPTIONAL,

sourceSL-CommConfig-r12 SL-CommConfig-r12 OPTIONAL,

sourceSL-DiscConfig-r12 SL-DiscConfig-r12 OPTIONAL

}

AS-Config-v1320 ::= SEQUENCE {

sourceSCellConfigList-r13 SCellToAddModListExt-r13 OPTIONAL,

sourceRCLWI-Configuration-r13 RCLWI-Configuration-r13 OPTIONAL

}

AS-Config-v13c0 ::= SEQUENCE {

radioResourceConfigDedicated-v13c01 RadioResourceConfigDedicated-v1370 OPTIONAL,

radioResourceConfigDedicated-v13c02 RadioResourceConfigDedicated-v13c0 OPTIONAL,

sCellToAddModList-v13c0 SCellToAddModList-v13c0 OPTIONAL,

sCellToAddModListExt-v13c0 SCellToAddModListExt-v13c0 OPTIONAL

}

AS-Config-v1430 ::= SEQUENCE {

sourceSL-V2X-CommConfig-r14 SL-V2X-ConfigDedicated-r14 OPTIONAL,

sourceLWA-Config-r14 LWA-Config-r13 OPTIONAL,

sourceWLAN-MeasResult-r14 MeasResultListWLAN-r13 OPTIONAL

}

AS-ConfigNR-r15 ::= SEQUENCE {

sourceRB-ConfigNR-r15 OCTET STRING OPTIONAL,

sourceRB-ConfigSN-NR-r15 OCTET STRING OPTIONAL,

sourceOtherConfigSN-NR-r15 OCTET STRING OPTIONAL

}

AS-ConfigNR-v1570 ::= SEQUENCE {

sourceSCG-ConfiguredNR-r15 ENUMERATED {true}

}

AS-Config-v1550 ::= SEQUENCE {

tdm-PatternConfig-r15 SEQUENCE {

subframeAssignment-r15 SubframeAssignment-r15,

harq-Offset-r15 INTEGER (0.. 9)

} OPTIONAL,

p-MaxEUTRA-r15 P-Max 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 |
| --- |
| ***antennaInfoCommon***  This field provides information about the number of antenna ports in the source PCell. |
| ***p-MaxEUTRA***  Indicates the *p-MaxEUTRA* in the source PCell. |
| ***sourceOtherConfigSN-NR***  Other NR config set by SN (cell group, measurements) in case of (NG)EN-DC i.e. as defined by the *RRCReconfiguration* message in TS 38.331 [82]. |
| ***sourceRB-ConfigNR***  NR radio bearer config, as defined by *RadioBearerConfig* IE in TS 38.331 [82]. The field may e.g. be set by MN in case of (NG)EN-DC, by source eNB connected to 5GCN. |
| ***sourceRB-ConfigSN-NR***  NR radio bearer config set by SN in case of (NG)EN-DC or of SN terminated RB without SCG, as defined by *RadioBearerConfig* IE in TS 38.331 [82]. |
| ***sourceDL-CarrierFreq***  Provides the parameter Downlink EARFCN in the source PCell, see TS 36.101 [42]. If the source eNB provides *AS-Config-v9e0*, it sets *sourceDl-CarrierFreq* (i.e. without suffix) to *maxEARFCN*. |
| ***sourceLWA-Config***  LWA configuration in the source PCell when handover is triggered. |
| ***sourceOtherConfig***  Provides other configuration in the source PCell. |
| ***sourceMasterInformationBlock***  *MasterInformationBlock* transmitted in the source PCell. |
| ***sourceMeasConfig***  Measurement configuration in the source cell. The measurement configuration for all measurements existing in the source eNB when handover is triggered shall be included. See 10.5. |
| ***sourceRCLWI-Configuration***  RCLWI Configuration in the source PCell. |
| ***sourceSL-CommConfig***  This field covers the sidelink communication configuration. |
| ***sourceSL-DiscConfig***  This field covers the sidelink discovery configuration. |
| ***sourceRadioResourceConfig***  Radio configuration in the source PCell. The radio resource configuration for all radio bearers existing in the source PCell when handover is triggered shall be included. See 10.5. |
| ***sourceSCellConfigList***  Radio resource configuration (common and dedicated) of the SCells configured in the source eNB. |
| ***sourceSCG-ConfiguredNR***  Value *true* indicates that the UE is configured with NR SCG in source configuration. The field is included only if *sourceOtherConfigSN-NR* is not included. |
| ***sourceSecurityAlgorithmConfig***  This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source PCell. |
| ***sourceSystemInformationBlockType1***  *SystemInformationBlockType1* (or *SystemInformationBlockType1-BR*) transmitted in the source PCell. |
| ***sourceSystemInformationBlockType2***  *SystemInformationBlockType2* transmitted in the source PCell. |
| ***sourceSL-V2X-CommConfig***  Indicates the V2X sidelink communication related configurations configured in the source eNB. |
| ***sourceWLAN-MeasResult***  WLAN measurement results in the source PCell when handover is triggered. |
| ***tdm-PatternConfig***  Indicates the TDM pattern configuration in the source PCell. |

#### – *AS-Context*

The IE *AS-Context* is used to transfer local E-UTRAN context required by the target eNB.

*AS-Context* information element

-- ASN1START

AS-Context ::= SEQUENCE {

reestablishmentInfo ReestablishmentInfo OPTIONAL -- Cond HO

}

AS-Context-v1130 ::= SEQUENCE {

idc-Indication-r11 OCTET STRING (CONTAINING

InDeviceCoexIndication-r11) OPTIONAL, -- Cond HO2

mbmsInterestIndication-r11 OCTET STRING (CONTAINING

MBMSInterestIndication-r11) OPTIONAL, -- Cond HO2

powerPrefIndication-r11 OCTET STRING (CONTAINING

UEAssistanceInformation-r11) OPTIONAL, -- Cond HO2

...,

[[ sidelinkUEInformation-r12 OCTET STRING (CONTAINING

SidelinkUEInformation-r12) OPTIONAL -- Cond HO2

]],

[[ sourceContextEN-DC-r15 OCTET STRING OPTIONAL -- Cond HO2

]],

[[ selectedbandCombinationInfoEN-DC-v1540 OCTET STRING OPTIONAL -- Cond HO2

]]

}

AS-Context-v1320 ::= SEQUENCE {

wlanConnectionStatusReport-r13 OCTET STRING (CONTAINING

WLANConnectionStatusReport-r13) OPTIONAL -- Cond HO2

}

AS-Context-v16xy ::= SEQUENCE {

sidelinkUEInformationNR-r16 OCTET STRING (CONTAINING

SidelinkUEInformationNR-r16) OPTIONAL, -- Cond HO3

ueAssistanceInformationNR-r16 OCTET STRING (CONTAINING

UEAssistanceInformationNR-r16) OPTIONAL -- Cond HO3

}

-- ASN1STOP

| *AS-Context* field descriptions |
| --- |
| ***idc-Indication***  Including information used for handling the IDC problems. |
| ***reestablishmentInfo***  Including information needed for the RRC connection re-establishment. |
| ***sourceContextEN-DC***  (NG)EN-DC related context information, in particular regarding the UE capability coordination, as defined by the *ConfigRestrictInfoSCG* IE specified in TS 38.331 [82]. |
| ***selectedBandCombinationInfoEN-DC***  Including the *BandCombinationInfoSN* IE specified in TS 38.331 [82]. See NOTE 1. |

| Conditional presence | Explanation |
| --- | --- |
| *HO* | The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present. |
| *HO2* | The field is optional present in case of handover within E-UTRA; otherwise the field is not present. |
| *HO3* | The field is optional present in case of handover within E-UTRA, or handover from NR to E-UTRA; otherwise the field is not present. |

NOTE 1: If the field is present, it is used to help target MN to decide appropriate LTE band for SCell frequency measurement in case of inter-MN handover without SN change.

#### – *ReestablishmentInfo*

The *ReestablishmentInfo* IE contains information needed for the RRC connection re-establishment.

*ReestablishmentInfo* information element

-- ASN1START

ReestablishmentInfo ::= SEQUENCE {

sourcePhysCellId PhysCellId,

targetCellShortMAC-I ShortMAC-I,

additionalReestabInfoList AdditionalReestabInfoList OPTIONAL,

...

}

AdditionalReestabInfoList ::= SEQUENCE ( SIZE (1..maxReestabInfo) ) OF AdditionalReestabInfo

AdditionalReestabInfo ::= SEQUENCE{

cellIdentity CellIdentity,

key-eNodeB-Star Key-eNodeB-Star,

shortMAC-I ShortMAC-I

}

Key-eNodeB-Star ::= BIT STRING (SIZE (256))

-- ASN1STOP

| *ReestablishmentInfo field descriptions* |
| --- |
| ***additionalReestabInfoList***  Contains a list of shortMAC-I and KeNB\* for cells under control of the target eNB, required for potential re-establishment by the UE in these cells to succeed. |
| ***Key-eNodeB-Star***  Parameter KeNB\*: See TS 33.401 [32], clause 7.2.8.4. If the cell identified by *cellIdentity* belongs to multiple frequency bands, the source eNB selects the DL-EARFCN for the KeNB\* calculation using the same logic as UE uses when selecting the DL-EARFCN in IDLE as defined in clause 6.2.2. This parameter is only used for X2 handover, and for S1 handover, it shall be ignored by target eNB. |
| ***sourcePhyCellId***  The physical cell identity of the source PCell, used to determine the UE context in the target eNB at re-establishment. |
| ***targetCellShortMAC-I***  The ShortMAC-I for the handover target PCell, in order for potential re-establishment to succeed. |

#### – *RRM-Config*

The *RRM-Config* IE contains information about UE specific RRM information before the handover which can be utilized by target eNB.

*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

]],

[[ candidateCellInfoListNR-r15 MeasResultServFreqListNR-r15 OPTIONAL

]]

}

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,

...,

[[ dl-CarrierFreq-v1090 ARFCN-ValueEUTRA-v9e0 OPTIONAL

]],

[[ rsrqResult-v1250 RSRQ-Range-v1250 OPTIONAL

]],

[[ rs-sinr-Result-r13 RS-SINR-Range-r13 OPTIONAL

]]

}

-- ASN1STOP

| *RRM-Config* field descriptions |
| --- |
| ***candidateCellInfoList***  A list of the best cells on each frequency for which measurement information was available, in order of decreasing RSRP. |
| ***candidateCellInfoListNR***  A list of NR cells including serving cells and best neighbour cells on each SSB requency, for which measurement results were available, and for each cell the best beams. |
| ***dl-CarrierFreq***  The source includes *dl-CarrierFreq-v1090* if and only if *dl-CarrierFreq-r10* is set to *maxEARFCN*. |
| ***ue-InactiveTime***  Duration while UE has not received or transmitted any user data. Thus the timer is still running in case e.g., UE measures the neighbour cells for the HO purpose. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on. Value min1 corresponds to 1 minute, value min1s20 corresponds to 1 minute and 20 seconds, value min1s40 corresponds to 1 minute and 40 seconds and so on. Value hr1 corresponds to 1 hour, hr1min30 corresponds to 1 hour and 30 minutes and so on. |

## 10.4 Inter-node RRC multiplicity and type constraint values

### – Multiplicity and type constraints definitions

-- ASN1START

maxReestabInfo INTEGER ::= 32 -- Maximum number of KeNB\* and shortMAC-I forwarded

-- at handover for re-establishment preparation

-- ASN1STOP

### – End of *EUTRA-InterNodeDefinitions*

-- ASN1START

END

-- ASN1STOP

## 10.5 Mandatory information in *AS-Config*

The *AS-Config* transferred between source eNB and target-eNB shall include all IEs necessary to describe the AS context. The conditional presence in clause 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 fields 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*.

All the fields in the *AS-Config* as defined in 10.3 that are introduced after v9.2.0 and that are optional for eNB to UE communication shall be included, if the functionality is configured, except for the fields *sourceOtherConfigSN-NR* and *sourceRB-ConfigSN-NR* in AS*-ConfigNR*. The fields in the *AS-Config* that are defined before and including v9.2.0 shall be included as specified in the following.

Within the *sourceRadioResourceConfig,* *sourceMeasConfig* and *sourceOtherConfig*, the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explicitly specified otherwise in the following:

- in accordance with a condition that is explicitly 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;

The following fields, if the functionality is configured, are not mandatory for the source eNB to include in the *AS-Config* since delta signalling by the target eNB for these fields is not supported:

- *semiPersistSchedC-RNTI*

*- measGapConfig*

For the measurement configuration, a corresponding operation as 5.5.6.1 and 5.5.2.2a is executed by target eNB.

## 10.6 Inter-node NB-IoT messages

### 10.6.1 General

This clause specifies NB-IoT 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 NB-IoT RRC messages transferred across network nodes.

### – *NB-IoT-InterNodeDefinitions*

This ASN.1 segment is the start of the NB-IoT inter-node PDU definitions.

-- ASN1START

NBIOT-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

C-RNTI,

PhysCellId,

SecurityAlgorithmConfig,

ShortMAC-I

FROM EUTRA-RRC-Definitions

AdditionalReestabInfoList

FROM EUTRA-InterNodeDefinitions

CarrierFreq-NB-r13,

CarrierFreq-NB-v1550,

RadioResourceConfigDedicated-NB-r13,

UECapabilityInformation-NB,

UE-Capability-NB-r13,

UE-Capability-NB-Ext-r14-IEs,

UE-RadioPagingInfo-NB-r13

FROM NBIOT-RRC-Definitions;

-- ASN1STOP

### 10.6.2 Message definitions

#### – *HandoverPreparationInformation-NB*

This message is used to transfer the UE context from the eNB where the RRC connection has been suspended and transfer it to the eNB where the RRC Connection has been requested to be resumed.

Direction: source eNB to target eNB

*HandoverPreparationInformation-NB* message

-- ASN1START

HandoverPreparationInformation-NB ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

handoverPreparationInformation-r13 HandoverPreparationInformation-NB-IEs,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

HandoverPreparationInformation-NB-IEs ::= SEQUENCE {

ue-RadioAccessCapabilityInfo-r13 UE-Capability-NB-r13,

as-Config-r13 AS-Config-NB,

rrm-Config-r13 RRM-Config-NB OPTIONAL,

as-Context-r13 AS-Context-NB OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-NB-v1380-IEs OPTIONAL

}

HandoverPreparationInformation-NB-v1380-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension HandoverPreparationInformation-NB-Ext-r14-IEs OPTIONAL

}

HandoverPreparationInformation-NB-Ext-r14-IEs ::= SEQUENCE {

ue-RadioAccessCapabilityInfoExt-r14 OCTET STRING (CONTAINING UE-Capability-NB-Ext-r14-IEs) OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *HandoverPreparationInformation-NB* field descriptions |
| --- |
| ***as-Config***  The radio resource configuration. |
| ***as-Context***  The local E-UTRAN context required by the target eNB. |
| ***rrm-Config***  The local E-UTRAN context used depending on the target node's implementation, which is mainly used for the RRM purpose. |
| ***ue-RadioAccessCapabilityInfo, ue-RadioAccessCapabilityInfoExt***  The NB-IoT UE Radio Access Capability Parameters, see TS 36.306 [5]. |

#### – *UEPagingCoverageInformation-NB*

This message is used to transfer UE paging coverage information for NB-IoT, covering both upload to and download from the EPC.

Direction: eNB to/from EPC

*UEPagingCoverageInformation-NB* message

-- ASN1START

UEPagingCoverageInformation-NB ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

uePagingCoverageInformation-r13 UEPagingCoverageInformation-NB-IEs,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UEPagingCoverageInformation-NB-IEs ::= SEQUENCE {

-- the possible value(s) can differ from those sent on Uu

npdcch-NumRepetitionPaging-r13 INTEGER (1..2048) OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UEPagingCoverageInformation-NB* field descriptions |
| --- |
| ***npdcch-NumRepetitionPaging***  Number of repetitions for NPDCCH, see TS 36.211 [21].This value is an estimate of the required number of repetitions for NPDCCH. |

#### – *UERadioAccessCapabilityInformation-NB*

This message is used to transfer UE NB-IoT Radio Access capability information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

*UERadioAccessCapabilityInformation-NB* message

-- ASN1START

UERadioAccessCapabilityInformation-NB ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

ueRadioAccessCapabilityInformation-r13

UERadioAccessCapabilityInformation-NB-IEs,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UERadioAccessCapabilityInformation-NB-IEs ::= SEQUENCE {

ue-RadioAccessCapabilityInfo-r13 OCTET STRING (CONTAINING UE-Capability-NB-r13),

nonCriticalExtension UERadioAccessCapabilityInformation-NB-v1380-IEs OPTIONAL

}

UERadioAccessCapabilityInformation-NB-v1380-IEs ::= SEQUENCE {

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension UERadioAccessCapabilityInformation-NB-r14-IEs OPTIONAL

}

UERadioAccessCapabilityInformation-NB-r14-IEs ::= SEQUENCE {

ue-RadioAccessCapabilityInfo-r14 OCTET STRING (CONTAINING UECapabilityInformation-NB) OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UERadioAccessCapabilityInformation-NB* field descriptions |
| --- |
| ***ue-RadioAccessCapabilityInfo***  The NB-IoT UE Radio Access Capability Parameters, see TS 36.306 [5]. |

#### – *UERadioPagingInformation-NB*

This message is used to transfer NB-IoT radio paging information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

*UERadioPagingInformation-NB* message

-- ASN1START

UERadioPagingInformation-NB ::= SEQUENCE {

criticalExtensions CHOICE {

c1 CHOICE{

ueRadioPagingInformation-r13 UERadioPagingInformation-NB-IEs,

spare3 NULL, spare2 NULL, spare1 NULL

},

criticalExtensionsFuture SEQUENCE {}

}

}

UERadioPagingInformation-NB-IEs ::= SEQUENCE {

ue-RadioPagingInfo-r13 OCTET STRING (CONTAINING UE-RadioPagingInfo-NB-r13),

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- ASN1STOP

| *UERadioPagingInformation-NB* field descriptions |
| --- |
| ***ue-RadioPagingInfo***  The field is used to transfer UE NB-IoT capability information used for paging. The eNB generates the *ue-RadioPagingInfo* andthe contained UE capability information is absent when not supported bythe UE. |

## 10.7 Inter-node NB-IoT RRC information element definitions

#### – *AS-Config-NB*

The *AS-Config-NB* IE contains information about NB-IoT RRC configuration information in the source eNB which can be utilized by target eNB.

*AS-Config-NB* information element

-- ASN1START

AS-Config-NB ::= SEQUENCE {

sourceRadioResourceConfig-r13 RadioResourceConfigDedicated-NB-r13,

sourceSecurityAlgorithmConfig-r13 SecurityAlgorithmConfig,

sourceUE-Identity-r13 C-RNTI,

sourceDl-CarrierFreq-r13 CarrierFreq-NB-r13,

...,

[[ sourceDL-CarrierFreq-v1550 CarrierFreq-NB-v1550 OPTIONAL -- Cond TDD

]]

}

-- ASN1STOP

| *AS-Config-NB* field descriptions |
| --- |
| ***sourceDL-CarrierFreq***  Provides the parameter Downlink EARFCN in the source PCell, see TS 36.101 [42]. |
| ***sourceRadioResourceConfig***  Radio configuration in the source PCell. The radio resource configuration for all radio bearers existing in the source PCell shall be included. See 10.9. |
| ***sourceSecurityAlgorithmConfig***  This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source PCell. |

| Conditional presence | Explanation |
| --- | --- |
| *TDD* | The field is optionally present in case of TDD; otherwise the field is not present. |

#### – *AS-Context-NB*

The IE *AS-Context-NB* is used to transfer the UE context required by the target eNB.

*AS-Context-NB* information element

-- ASN1START

AS-Context-NB ::= SEQUENCE {

reestablishmentInfo-r13 ReestablishmentInfo-NB OPTIONAL,

...

}

-- ASN1STOP

| *AS-Context-NB* field descriptions |
| --- |
| ***reestablishmentInfo***  Including information needed for the RRC connection re-establishment. |

#### – *ReestablishmentInfo-NB*

The *ReestablishmentInfo-NB* IE contains information needed for the RRC connection re-establishment.

*ReestablishmentInfo-NB* information element

-- ASN1START

ReestablishmentInfo-NB ::= SEQUENCE {

sourcePhysCellId-r13 PhysCellId,

targetCellShortMAC-I-r13 ShortMAC-I,

additionalReestabInfoList-r13 AdditionalReestabInfoList OPTIONAL,

...

}

-- ASN1STOP

| *ReestablishmentInfo-NB field descriptions* |
| --- |
| ***additionalReestabInfoList***  Contains a list of shortMAC-I and KeNB\* for cells under control of the target eNB, required for potential re-establishment by the UE in these cells to succeed. |
| ***sourcePhyCellId***  The physical cell identity of the source PCell, used to determine the UE context in the target eNB at re-establishment. |
| ***targetCellShortMAC-I***  The ShortMAC-I for the target PCell, in order for potential re-establishment to succeed. |

#### – *RRM-Config-NB*

The *RRM-Config-NB* IE contains information about UE specific RRM information which can be utilized by target eNB.

*RRM-Config-NB* information element

-- ASN1START

RRM-Config-NB ::= SEQUENCE {

ue-InactiveTime ENUMERATED {

s1, s2, s3, s5, s7, s10, s15, s20,

s25, s30, s40, s50, min1, min1s20, min1s40,

min2, min2s30, min3, min3s30, min4, min5, min6,

min7, min8, min9, min10, min12, min14, min17, min20,

min24, min28, min33, min38, min44, min50, hr1,

hr1min30, hr2, hr2min30, hr3, hr3min30, hr4, hr5, hr6,

hr8, hr10, hr13, hr16, hr20, day1, day1hr12, day2,

day2hr12, day3, day4, day5, day7, day10, day14, day19,

day24, day30, dayMoreThan30} OPTIONAL,

...

}

-- ASN1STOP

| *RRM-Config-NB* field descriptions |
| --- |
| ***ue-InactiveTime***  Duration while UE has not received or transmitted any user data. 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. |

## 10.8 Inter-node RRC multiplicity and type constraint values

### – Multiplicity and type constraints definitions

### – End of *NB-IoT-InterNodeDefinitions*

-- ASN1START

END

-- ASN1STOP