**3GPP TSG-RAN2 Meeting #111-e Draft\_R2-2008303**

**Online, 17th - 28th Aug. 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.331** | **CR** | **4380** | **rev** | **1** | **Current version:** | **16.1.1** |  |
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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 for Rel-16 NB-IoT | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
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| ***Work item code:*** | NB\_IOTenh3-Core, LTE\_eMTC5-Core | | | | |  | ***Date:*** | | | 2020-08-26 |
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| ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. In section 5.2.2.9, defaultPagingCycle is always used for NB-IoT UE, which is not correct if UE specific DRX cycle is configured by higher layer and enabled in the cell.  2. In RRCConnectionRelease-NB, there are two options for resume ID, i.e.  resumeIdentity-r13 and resumeIdentity-r16. How to use the two options is not clear.  3. In section 7.3.1, UP transmission using PUR is not considered in the stop conditions of T302, T303, T305, T306, T308, T320, T322, T323.  4. In section 10.6.2, the following inter-node messages also apply to 5GC but 5GC is missing in the message descriptions:   * UEPagingCoverageInformation-NB * UERadioAccessCapabilityInformation-NB * UERadioPagingInformation-NB   5. In section 11.2, table 11.2-2, transmission using PUR is missing.  6. In section A.6, PURConfigurationRequest cannot be sent (unprotected) prior to security activation, which is not correct for the UE using Control plane CIoT EPS/5GS optimisation.  7. In section A.6, the impact of early secuirty reactivation on RRCConnectionRelease/Resume/Reject messages is not captured.  8. In PUR-Config-NB, the downlink carrier configuration is specified by IE DL-CarrierConfigCommon-NB-r14, which is used to specify the configuration for a DL non-anchor carrier in common signalling. As PUR configuration is UE specific, IE DL-CarrierConfigDedicated-NBshould have beenused instead. | | | | | | | | |
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| ***Summary of change:*** | | 1. In section 5.2.2.9, clarify that if UE specific DRX cycle is configured by higher layer and ue-SpecificDRX-CycleMin is broadcast in the cell, the UE applies min (defaultPagingCycle, max (the (UE specific) paging cycle, ue-SpecificDRX-CycleMin)).  2. In RRCConnectionRelease-NB, clarify in the field description that resumeIdentity-r13 is only configured when the UE is connected to EPC and resumeIdentity-r16 is only configured when the UE is connected to 5GC.  3. In section 7.3.1, add UP transmission using PUR to the stop conditions of T302, T303, T305, T306, T308, T320, T322, T323.  4. In section 10.6.2, add 5GC to “Direction” of the following inter-node messages:   * UEPagingCoverageInformation-NB * UERadioAccessCapabilityInformation-NB * UERadioPagingInformation-NB   5. In section 11.2, table 11.2-2, transmission using PUR is added.  6. In section A.6, clarify that PURConfigurationRequest message can be sent (unprotected) prior to security activation only when Control plane CIoT EPS/5GS optimisation is used.  7. In section A.6, clarify that RRCConnectionRelease/Resume/Reject messages cannot be sent without integrity protection and unciphered for resumption of an RRC connection after early security reactivation.  8. In PUR-Config-NB, delete dl-CarrierConfig-r16 and ul-CarrierFreq-r16. A new field carrierConfig-r16 is introduced, referring to IE CarrierConfigDedicated-NB-r13.  9. Editorial corrections.  **Impact Analysis**  Impacted functionality:  Rel-16 NB-IoT and eMTC  Inter-operability:  The 8th change is an ASN.1 non backward compatible change.  No other inter-operability issue is foreseen. | | | | | | | | |
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| ***Consequences if not approved:*** | | The specification is incorrect, incomplete or ambiguous. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2.2.9, 5.3.3.19, 5.3.8.3, 6.7.2, 6.7.3.1, 6.7.3.2, 7.3.1, 10.6.2, 11.2, A.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **N** | Other core specifications | | | |  | | |
| ***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 |

#### 5.2.2.9 Actions upon reception of *SystemInformationBlockType2*

Upon receiving *SystemInformationBlockType2*, the UE shall:

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

1> if in RRC\_INACTIVE:

2> apply the shortest of the *ran-PagingCycle* (if configured), the (UE specific) paging cycle (if indicated by upper layers), and the *defaultPagingCycle* included in the *radioResourceConfigCommon*;

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

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

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

2> consider that DL assignments may occur in the MBSFN subframes indicated in the *mbsfn-SubframeConfigList* under the conditions specified in TS 36.213 [23], clause 7.1;

1> apply the specified PCCH configuration defined in 9.1.1.3;

1> not apply the *timeAlignmentTimerCommon*;

1> if in RRC\_CONNECTED and UE is configured with RLF timers and constants values received within *rlf-TimersAndConstants*:

2> not update its values of the timers and constants in *ue-TimersAndConstants* except for the value of timer T300;

1> if in RRC\_CONNECTED while T311 is not running; and the UE supports multi-band cells as defined by bit 31 in *featureGroupIndicators* or *multipleNS-Pmax*:

2> disregard the *additionalSpectrumEmission* and *ul-CarrierFreq*, ifreceived, while in RRC\_CONNECTED;

1> if *attachWithoutPDN-Connectivity* is received for the selected PLMN:

2> forward a*ttachWithoutPDN-Connectivity* to upper layers;

1> else:

2> indicate to upper layers that *attachWithoutPDN-Connectivity* is not present;

1> if *cp-CIoT-EPS-Optimisation* is received for the selected PLMN:

2> forward *cp-CIoT-EPS-Optimisation* to upper layers;

1> else:

2> indicate to upper layers that *cp-CIoT-EPS-Optimisation* is not present;

1> if *up-CIoT-EPS-Optimisation* is received for the selected PLMN:

2> forward *up-CIoT-EPS-Optimisation* to upper layers;

1> else:

2> indicate to upper layers that *up-CIoT-EPS-Optimisation* is not present;

1> if *SystemInformationBlockType26a* is not present:

2> to upper layers either forward *upperLayerIndication*, if present for the selected PLMN, or otherwise indicate absence of this field;

NOTE: *upperLayerIndication* is an indication to upper layers that the UE has entered a coverage area that offers 5G capabilities.

1> to upper layers either forward *rlos-Enabled*, if present, or otherwise indicate absence of this field;

Upon receiving *SystemInformationBlockType2-NB*, the UE shall:

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

1> if upper layers indicate that a (UE specific) paging cycle is configured and *ue-SpecificDRX-CycleMin* is included in the *radioResourceConfigCommon*:

2> apply the shortest of max ((UE specific) paging cycle, *ue-SpecificDRX-CycleMin*) and the *defaultPagingCycle* included in the *radioResourceConfigCommon*;

1> else:

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

1> if *SystemInformationBlockType22-NB* is scheduled:

2> read and act on information sent in *SystemInformationBlockType22-NB*;

1> apply the specified PCCH configuration defined in 9.1.1.3.

1> if in RRC\_CONNECTED and UE is configured with RLF timers and constants values received within *rlf-TimersAndConstants*:

2> not update its values of the timers and constants in *ue-TimersAndConstants* except for the value of timer T300;

Upon receiving *SystemInformationBlockType2* (*SystemInformationBlockType2-NB* in NB-IoT), the UE shall:

1> if *up-PUR-5GC* is not included and the UE connected to 5GC in RRC\_IDLE with a suspended RRC connection is configured with *pur-Config*; or

1> if *up-PUR-EPC* is not included and the UE connected to EPC in RRC\_IDLE with a suspended RRC connection is configured with *pur-Config*; or

1> if *cp-PUR-5GC* is not included and the UE connected to 5GC in RRC\_IDLE without a suspended RRC connection is configured with *pur-Config*; or

1> if *cp-PUR-EPC* is not included and the UE connected to EPC in RRC\_IDLE without a suspended RRC connection is configured with *pur-Config*:

2> if *pur-TimeAlignmentTimer* is configured, indicate to lower layers that *pur-TimeAlignmentTimer* is released;

2> release *pur-Config*;

2> discard previously stored *pur-Config*.

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| Next change |

#### 5.3.3.19 Timing alignment validation for transmission using PUR

A UE shall consider the timing alignment value for transmission using PUR to be valid when all of the following conditions are fulfilled:

1> if *pur-TimeAlignmentTimer* is configured:

2> *pur-TimeAlignmentTimer* is running as confirmed by lower layers;

1> if *pur-RSRP-ChangeThreshold* (*pur-NRSRP-ChangeThreshold* in NB-IoT) is configured:

2> since the last TA validation, the serving cell (N)RSRP has not increased by more than *increaseThresh*; and

2> since the last TA validation, the serving cell (N)RSRP has not decreased by more than *decreaseThresh*;

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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 subclause 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 subclause 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 subclause 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 0: 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;

2> stop timer T323, if running;

1> except for UEs using the Control Plane CIoT 5GS optimisation, 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> ignore the *altFreqPriorities* and T323, if included;

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 if the *RRCConnectionRelease* message includes the *altFreqPriorities*:

2> store the received *altFreqPriorities*;

2> for E-UTRA frequency, apply the alternative cell reselection priority information broadcast in the system information if available, otherwise apply the cell reselection priority broadcast in the system information;

2> for inter-RAT frequency, apply the cell reselection priority broadcast in the system information;

2> if the *t323* is included:

3> start timer T323, with the timer value set according to the value of *t323*;

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*;

NOTE 2: If the *measIdleConfig* contains neither *measIdleCarrierListEUTRA* nor *measIdleCarrierListNR*, UE may receive *measIdleCarrierListEUTRA* and/or *measIdleCarrierListNR* as specified in 5.6.20.1a.

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

2> clear *VarANR-MeasConfig-NB* and *VarANR-MeasReport-NB*;

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> if *pur-TimeAlignmentTimer* is included in the received *pur-Config*:

4> configure lower layers in accordance with *pur-TimeAlignmentTimer*;

3> else:

4> if *pur-TimeAlignmentTimer* is configured, indicate to lower layers that *pur-TimeAlignmentTimer* is released;

3> start maintenance of PUR occasions as specified in 5.3.3.20;

2> else:

3> if *pur-TimeAlignmentTimer* is configured, indicate to lower layers that *pur-TimeAlignmentTimer* is released;

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

3> discard previously stored *pur-Config*;

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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| Next change |

### 6.7.2 NB-IoT Message definitions

#### – *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-v1610-IEs OPTIONAL

}

RRCConnectionRelease-NB-v1610-IEs ::= SEQUENCE {

resumeIdentity-r16 I-RNTI-r15 OPTIONAL, -- Need OR

anr-MeasConfig-r16 ANR-MeasConfig-NB-r16 OPTIONAL, -- Need OP

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 |
| --- |
| ***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 and/or if the UE is connected to 5GC. |
| ***resumeIdentity***  UE identity to facilitate UE context retrieval at eNB. E-UTRAN configures *resumeIdentity-r13* only when the UE is connected to EPC and configures *resumeIdentity-r16* onlywhen 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. |

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| Next change |

#### 6.7.3.1 NB-IoT System information blocks

#### – *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 UAC-Barring-NB-r16,

uac-BarringPerPLMN-List 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. |

|  |
| --- |
| Next change |

#### – *SystemInformationBlockType27-NB*

The IE *SystemInformationBlockType27-NB* contains 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***  Indicates that the GERAN carrier frequencies support EC-GSM-IOT. |
| ***peo***  Indicates that the GERAN carrier frequencies support Power Efficient Operation (PEO). |
| ***sib1***  Indicates that SIB1 is scheduled in the E-UTRAN cells. |
| ***sib1-BR***  Indicates that SIB1-BR is scheduled in the E-UTRAN cells. |

|  |
| --- |
| Next change |

6.7.3.2 NB-IoT Radio resource control information elements

#### *– 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 GWUS-NumGroupsList-NB-r16 OPTIONAL, -- Need OP

groupsForServiceList-r16 GWUS-GroupsForServiceList-NB-r16

OPTIONAL -- Cond probabilityBased

}

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}

GWUS-NumGroupsList-NB-r16 ::= SEQUENCE (SIZE (1..maxGWUS-Resources-NB-r16)) OF

GWUS-NumGroups-NB-r16

GWUS-NumGroups-NB-r16 ::= ENUMERATED {n1, n2, n4, n8}

GWUS-GroupsForServiceList-NB-r16 ::= SEQUENCE (SIZE (1..maxGWUS-ProbThresholds-NB-r16)) OF

INTEGER (1..maxGWUS-Groups-1-NB-r16)

-- 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 paging probability group, second entry corresponds to the second paging probability group, and so on. E-UTRAN includes the same number of entries and in the same order in *groupsForServiceList* and *probThreshList*.  Total number of WUS groups in this list cannot be more than total number of WUS groups in *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 short 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*  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*.  E-UTRAN may only configure *secondary* when only one entry exists in *numGroupsList* and *wus-Config* is present in *SystemInformationBlockType2-NB*.  If two entries exist in *numGroupsList*, the position for the second WUS resource corresponds to value *secondary*. |
| ***timeParameters***  Time domain WUS configuration information. For individual field descriptions, see *WUS-Config-NB.* If the field is absent, the parameters in *wus-Config* apply. |

|  |  |
| --- | --- |
| 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. |
| *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. |

|  |
| --- |
| Next change |

#### – *PUR-Config-NB*

The IE *PUR-Config-NB* is used to specify PUR configuration.

*PUR-Config-NB* information element

-- ASN1START

PUR-Config-NB-r16 ::= SEQUENCE {

pur-ConfigID-r16 PUR-ConfigID-NB-r16 OPTIONAL, --Need OR

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-StartTimeParameters-r16 SEQUENCE {

periodicityAndOffset-r16 PUR-PeriodicityAndOffset-NB-r16,

startSFN-r16 INTEGER (0..1023),

startSubframe-r16 INTEGER (0..9),

hsfn-LSB-Info-r16 BIT STRING (SIZE(1))

} OPTIONAL, --Need ON

pur-NumOccasions-r16 ENUMERATED {one, infinite},

pur-PhysicalConfig-r16 SEQUENCE {

carrierConfig-r16 CarrierConfigDedicated-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)

},

p0-UE-NPUSCH-r16 INTEGER (-8..7),

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

...

}

PUR-NRSRP-ChangeThreshold-r16 ::= SEQUENCE {

increaseThresh-r16 NRSRP-ChangeThresh-NB-r16,

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. |
| ***carrierConfig***  Carrier used for PUR. |
| ***hsfn-LSB-Info***  LSB of the H-SFN corresponding to the last subframe of the first transmission of *RRCConnectionRelease* message containing *pur-Config*. |
| ***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***  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***  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***  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, indicates the subcarrier used for PUR specified in TS 36.213 [23].  For NPUSCH transmission with subcarrier spacing 15 kHz, 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 16.2.1.1.1, 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***  Threshold(s) of change in serving cell NRSRP in dB for TA validation. Value *dB4* corresponds to 4 dB, value *dB6* corresponds to 6 dB, and so on. When *pur-NRSRP-ChangeThreshold* is set to *setup*, if *decreaseThrsh* is absent the value of *increaseThresh* is also used for *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-PeriodicityAndOffset***  Indicates the periodicity for the PUR occasions and time offset until the first PUR occasion. |
| ***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-TimeAlignmentTimer***  Value of the time alignment timer for PUR. Value in number of periodicity of PUR. |

|  |
| --- |
| Next change |

#### – *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

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-r16 BIT STRING (SIZE (5)) OPTIONAL, -- Cond Bitmap1

symbolBitmap2-r16 BIT STRING (SIZE (5)) OPTIONAL -- Cond Bitmap2

},

symbolBitmapFddUlOrTdd SEQUENCE {

symbolBitmap1-r16 BIT STRING (SIZE (7)) OPTIONAL, -- Cond Bitmap1

symbolBitmap2-r16 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***  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 value of *slotBitmap* corresponditing to at least one subrame is '01'; otherwise the field is not present. |
| *Bitmap2* | The field is optional present, need OR, if value of *slotBitmap* corresponditing to at least one subrame is '10'; otherwise the field is not present. |

|  |
| --- |
| Next change |

### 7.3.1 Timers (Informative)

| Timer | Start | Stop | At expiry |
| --- | --- | --- | --- |
| T300  NOTE1 | Transmission of *RRCConnectionRequest* or *RRCConnectionResumeRequest* or *RRCEarlyDataRequest* | Reception of *RRCConnectionSetup*, *RRCConnectionReject* or *RRCConnectionResume* or *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT, cell re-selection and upon abortion of connection establishment by upper layers | Perform the actions as specified in 5.3.3.6 |
| T301  NOTE1 | Transmission of *RRCConnectionReestabilshmentRequest* | Reception of *RRCConnectionReestablishment* or *RRCConnectionReestablishmentReject* message as well as when the selected cell becomes unsuitable | Go to RRC\_IDLE |
| T302 | Reception of *RRCConnectionReject* while performing RRC connection establishment or reception of *RRCConnectionRelease* including *waitTime* | Upon entering RRC\_CONNECTED and upon cell re-selection, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR, or upon reception of *RRCConnectionReject* message for E-UTRA/5GC. | Inform upper layers about barring alleviation as specified in 5.3.3.7 |
| T303 | Access barred while performing RRC connection establishment for mobile originating calls | Upon entering RRC\_CONNECTED and upon cell re-selection, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Inform upper layers about barring alleviation as specified in 5.3.3.7 |
| T304 | Reception of *RRCConnectionReconfiguration* message including the *MobilityControl Info* or  reception of *MobilityFromEUTRACommand* message including *CellChangeOrder* | Criterion for successful completion of handover within E-UTRA, handover to E-UTRA or cell change order is met (the criterion is specified in the target RAT in case of inter-RAT) | In case of cell change order from E-UTRA or intra E-UTRA handover, initiate the RRC connection re-establishment procedure; In case of handover to E-UTRA, perform the actions defined in the specifications applicable for the source RAT; If any DAPS bearer is configured and if there is no RLF in source PCell, initiate the failure information procedure. |
| T305 | Access barred while performing RRC connection establishment for mobile originating signalling | Upon entering RRC\_CONNECTED and upon cell re-selection, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Inform upper layers about barring alleviation as specified in 5.3.3.7 |
| T306 | Access barred while performing RRC connection establishment for mobile originating CS fallback. | Upon entering RRC\_CONNECTED and upon cell re-selection, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Inform upper layers about barring alleviation as specified in 5.3.3.7 |
| T307 | Reception of *RRCConnectionReconfiguration* message including *MobilityControlInfoSCG* | Successful completion of random access on the PSCell, upon initiating re-establishment and upon SCG release | Initiate the SCG failure information procedure as specified in 5.6.13. |
| T308 | Access barred due to ACDC while performing RRC connection establishment subject to ACDC | Upon entering RRC\_CONNECTED and upon cell re-selection, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Inform upper layers about barring alleviation for ACDC as specified in 5.3.3.7 |
| T309  NOTE1 | When access attempt is barred at access barring check for an Access Category. The UE shall maintain one instance of this timer per Access Category. | Upon entering RRC\_CONNECTED, upon cell (re)selection, upon reception of *RRCConnectionRelease,* upon change of PCell while in RRC\_CONNECTED, or upon reception of *MobilityFromEUTRACommand*. | Perform the actions as specified in 5.3.16.4. |
| T310  NOTE1  NOTE2 | Upon detecting physical layer problems for the PCell i.e. upon receiving N310 consecutive out-of-sync indications from lower layers | Upon receiving N311 consecutive in-sync indications from lower layers for the PCell, upon triggering the handover procedure, upon initiating the connection re-establishment procedure, and upon initiating the MCG failure information procedure. | If security is not activated and the UE is not a NB-IoT UE that supports RRC connection re-establishment for the Control Plane CIoT EPS/5GS optimisation: go to RRC\_IDLE else: initiate the MCG failure information procedure as specified in 5.6.26 or the connection re-establishment procedure as specified in 5.3.7. |
| T311  NOTE1 | Upon initiating the RRC connection re-establishment procedure | Selection of a suitable E-UTRA cell or a cell using another RAT. | Enter RRC\_IDLE |
| T312  NOTE2 | Upon triggering a measurement report for a measurement identity for which T312 has been configured, while T310 is running | Upon receiving N311 consecutive in-sync indications from lower layers, upon triggering the handover procedure, upon initiating the connection re-establishment procedure, upon initiating the MCG failure information procedure, and upon the expiry of T310 | If security is not activated: go to RRC\_IDLE else: initiate the MCG failure information procedure as specified in 5.6.26 or the connection re-establishment procedure as specified in 5.3.7. |
| T313  NOTE2 | Upon detecting physical layer problems for the PSCell i.e. upon receiving N313 consecutive out-of-sync indications from lower layers | Upon receiving N314 consecutive in-sync indications from lower layers for the PSCell, upon initiating the connection re-establishment procedure, upon SCG release and upon receiving *RRCConnectionReconfiguration* including *MobilityControlInfoSCG* | Inform E-UTRAN about the SCG radio link failure by initiating the SCG failure information procedure as specified in 5.6.13. |
| T316 | Upon transmission of the *MCGFailureInformation* message | Upon receiving *RRCConnectionRelease*, *RRCConnectionReconfiguration* with *mobilityControlInfo, MobilityFromEUTRACommand*, or upon initiaitng the re-establishment procedure, | Perform the actions as specified in 5.6.26.5. |
| T320 | Upon receiving *t320* or upon cell (re)selection to E-UTRA from another RAT with validity time configured for dedicated priorities (in which case the remaining validity time is applied). | Upon entering RRC\_CONNECTED, when PLMN selection is performed on request by NAS, when the UE enters RRC\_IDLE from RRC\_INACTIVE, or upon cell (re)selection to another RAT (in which case the timer is carried on to the other RAT) , or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Discard the cell reselection priority information provided by dedicated signalling. |
| T321 | Upon receiving *measConfig* including a *reportConfig* with the *purpose* set to *reportCGI* | Upon acquiring the information needed to set all fields of *cellGlobalId* for the requested cell, upon receiving *measConfig* that includes removal of the *reportConfig* with the *purpose* set to *reportCGI* and upon detecting that a cell is not broadcasting SIB1. | Initiate the measurement reporting procedure, stop performing the related measurements and remove the corresponding *measId* |
| T322  NOTE1 | Upon receiving *redirectedCarrierOffsetDedicated* included in *RedirectedCarrierInfo* | Upon entering RRC\_CONNECTED, when PLMN selection is performed on request by NAS, or upon cell (re)selection to another frequency or RAT, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Release *redirectedCarrierOffsetDedicated*. |
| T323 | Upon receiving *t323*. | Upon entering RRC\_CONNECTED, when PLMN selection is performed on request by NAS, when the UE enters RRC\_IDLE from RRC\_INACTIVE, or upon cell (re)selection to another RAT, or upon reception of *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR. | Discard the *altFreqPriorities* provided by dedicated signalling. UE shall apply the cell reselection priority information broadcast in the system information via *cellReselectionPriority* and *cellReselectionSubPriority*. |
| T325 | Timer (re)started upon receiving *RRCConnectionReject* message with *deprioritisationTimer*. |  | Stop deprioritisation of all frequencies or E-UTRA signalled by *RRCConnectionReject.* |
| T330 | Upon receiving *LoggedMeasurementConfiguration* message | Upon log volume exceeding the suitable UE memory, upon initiating the release of *LoggedMeasurementConfiguration* procedure | Perform the actions specified in 5.6.6.4 |
| T331 | Upon receiving *RRCConnectionRelease* message including *measIdleConfig.* | Upon receiving *RRCConnectionSetup, RRCConnectionResume, RRCConnectionRelease* with an idle/inactive measurement configuration or indication to release the configuration, if *validityArea* is configured, upon cell selection/reselection to a cell that does not belong to the *validityArea* (if configured)*,* or upon reselecting to an inter-RAT cell. | Perform the actions specified in 5.6.20.3. |
| T340  NOTE2 | Upon transmitting *UEAssistanceInformation* message with *powerPrefIndication* set to *normal* | Upon initiating the connection re-establishment procedure | No action. |
| T341  NOTE2 | Upon transmitting *UEAssistanceInformation* message with *bw-Preference.* | Upon resuming an RRC connection or upon initiating the connection re-establishment procedure | No action. |
| T342  NOTE2 | Upon transmitting *DelayBudgetReport* message. | Upon initiating the connection re-establishment and connection resume procedures | No action. |
| T350 | Upon entering RRC\_IDLE if *t350* has been received in wlan-OffloadInfo. | Upon entering RRC\_CONNECTED, or upon cell reselection. | Perform the actions specified in 5.6.12.4. |
| T351 | Reception of *RRCConnectionReconfiguration* message including the association*Timer* in *WLAN-MobilityConfig*. | Upon successful connection to WLAN, upon WLAN connection failure, upon leaving RRC\_CONNECTED, upon triggering the handover procedure, or upon initiating the connection re-establishment procedure. | Perform WLAN Connection Status Reporting specified in 5.6.15.2. |
| T360 | Upon performing the redistribution target selection as specified in TS 36.304 [4]. | Upon entering RRC\_CONNECTED, upon receiving a Paging message including *redistributionIndication*; upon reselecting a cell not belonging to the redistribution target. | Stop considering a frequency or cell to be redistribution target, and perform the redistribution target selection if the condition specified in TS 36.304 [4] is met. |
| T370 | Upon receiving *SL-DiscConfig* including a *discSysInfoToReportConfig* set to *setup.* | Upon initiating the transmission of *SidelinkUEInformation* including *discSysInfoReportFreqList*, upon receiving *SL-DiscConfig* including *discSysInfoToReportConfig* set to *release*, upon handover and re-establishment*.* | Release *discSysInfoToReportConfig*. |
| T314  NOTE2 | Upon early detecting physical layer problems for the PCell i.e. upon receiving N310 consecutive "early-out-of-sync" indications from lower layers. | Upon receiving N311 consecutive in-sync indications from lower layers for the PCell, upon triggering the handover procedure and upon initiating the connection re-establishment procedure | Initiate the UE Assistance Information procedure to report early detection of physical layer problems in accordance with 5.6.10. |
| T315  NOTE2 | Upon detecting physical layer improvements of the PCell i.e. upon receiving N311 consecutive "early-in-sync" indications from lower layers. | Upon receiving N310 consecutive "early-out-of-sync" indications from lower layers for the PCell. | Initiate the UE Assistance Information procedure to report detection of physical layer improvements in accordance with 5.6.10. |
| T343  NOTE2 | Upon transmitting *UEAssistanceInformation* message with *RLM-Report* including *earlyOutOfSync*. | Upon initiating the connection re-establishment procedure | No action. |
| T344  NOTE2 | Upon transmitting *UEAssistanceInformation* message with *RLM-Report* including *earlyInSync*. | Upon initiating the connection re-establishment procedure | No action. |
| T345 | Upon transmitting *UEAssistanceInformation* message with *overheatingAssistance* | Upon initiating the connection re-establishment procedure | No action. |
| T380 | Upon reception of *periodic-RNAU-timer* in RRCConnectionRelease. | Upon reception of *RRCConnectionResume*, *RRCConnectionRelease* or *RRCConnectionSetup*. | Initiate the RAN notification area update procedure |
| NOTE1: Only the timers marked with "NOTE1" are applicable to NB-IoT.  NOTE2: The behaviour as specified in 7.3.2 applies. | | | |

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| Next change |

### 10.6.2 Message definitions

#### – *UEPagingCoverageInformation-NB*

This message is used to transfer UE paging coverage information for NB-IoT, covering both upload to and download from the EPC/5GC.

Direction: eNB to/from EPC/5GC

*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/5GC.

Direction: eNB to/from EPC/5GC

*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/5GC.

Direction: eNB to/from EPC/5GC

*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. |

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| Next change |

## 11.2 Processing delay requirements for RRC procedures

The UE performance requirements for RRC procedures are specified in the following tables, by means of a value N:

N = the number of 1ms subframes from the end of reception of the E-UTRAN -> UE message on the UE physical layer up to when the UE shall be ready for the reception of uplink grant for the UE -> E-UTRAN response message with no access delay other than the TTI-alignment (e.g. excluding delays caused by scheduling, the random access procedure or physical layer synchronisation).

NOTE: No processing delay requirements are specified for RN-specific procedures.



Figure 11.2-1: Illustration of RRC procedure delay

Table 11.2-1: UE performance requirements for RRC procedures for UEs other than NB-IoT UEs

| **Procedure title:** | **E-UTRAN -> UE** | **UE -> E-UTRAN** | **N** | **Notes** |
| --- | --- | --- | --- | --- |
| **RRC Connection Control Procedures** | | | | |
| RRC connection establishment | *RRCConnectionSetup or RRCConnectionResume* | *RRCConnectionSetupComplete or RRCConnectionResumeComplete* | 15 or 3 | N = 3 applies for the case of reception of *RRCConnectionResume* if *reducedCP-LatencyEnabled* is configured, the UE supports reduced CP latency, and the RRC message only includes MAC and PHY (re-)configurations and does not include (re-)configurations of DRX, SPS, SCells, and MIMO. Further, the UL grant is sent using PDCCH DCI format 0 in common search space. In this scenario, the RRC procedure delay can extend beyond the reception of the UL grant, up to 7 ms.  For other cases N = 15 applies. |
| RRC connection release | *RRCConnectionRelease* |  | NA |  |
| RRC connection re-configuration (radio resource configuration, possibly including configuration of conditional reconfigurations) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 15 | Same requirement is applicable regardless of the number of target candidates being configured, if conditional reconfigurations are included in the message, |
| RRC connection re-configuration (measurement configuration) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 15 |  |
| RRC connection re-configuration (intra-LTE mobility) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 15 |  |
| RRC connection reconfiguration (SCell addition/release) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 |  |
| RRC connection reconfiguration (SCG establishment/ release, SCG cell addition/ release) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 |  |
| RRC connection re-configuration (NR measurement configuration) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 15 |  |
| RRC connection reconfiguration (NR SCG establishment/ /modification/release) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 |  |
| RRC connection re-configuration (intra-LTE mobility with NR SCG establishment/ /modification/release) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 |  |
| RRC connection re-establishment | *RRCConnectionReestablishment* | *RRCConnectionReestablishmentComplete* | 15 |  |
| Initial security activation | *SecurityModeCommand* | *SecurityModeCommandComplete/SecurityModeCommandFailure* | 10 |  |
| Initial security activation + RRC connection re-configuration (RB establishment) | *SecurityModeCommand, RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 | The two DL messages are transmitted in the same TTI |
| EDT or transmission using PUR | *RRCEarlyDataComplete* or *RRCConnectionRelease* for UP-EDT or UP transmission using PUR |  | NA |  |
| Paging | *Paging* |  | NA |  |
| **Inter RAT mobility** | | | | |
| Handover to E-UTRA | *RRCConnectionReconfiguration (sent by other RAT)* | *RRCConnectionReconfigurationComplete* | NA | The performance of this procedure is specified in TS 45.010 [50] in case of handover from GSM and TS 25.133 [29], TS 25.123 [30] in case of handover from UTRA. |
| Handover from E-UTRA | *MobilityFromEUTRACommand* |  | NA | The performance of this procedure is specified in TS 36.133 [16] |
| Handover from E-UTRA to CDMA2000 | *HandoverFromEUTRAPreparationRequest (CDMA2000)* |  | NA | Used to trigger the handover preparation procedure with a CDMA2000 RAT.  The performance of this procedure is specified in TS 36.133 [16] |
| **Measurement procedures** | | | | |
| Measurement Reporting |  | *MeasurementReport* | NA |  |
| **Other procedures** | | | | |
| UE capability transfer | *UECapabilityEnquiry* | *UECapabilityInformation* | 10/ 80 | N = 80 applies in case the UE has to report at least one of the following UE capabilities.  - MR-DC band combinations.  - NR band combinations  - EUTRA feature sets |
| Counter check | *CounterCheck* | *CounterCheckResponse* | 10 |  |
| Proximity indication |  | *ProximityIndication* | NA |  |
| UE information | *UEInformationRequest* | *UEInformationResponse* | 15 |  |
| MBMS counting | *MBMSCountingRequest* | *MBMSCountingResponse* | NA |  |
| MBMS interest indication |  | *MBMSInterestIndication* | NA |  |
| In-device coexistence indication |  | *InDeviceCoexIndication* | NA |  |
| UE assistance information |  | *UEAssistanceInformation* | NA |  |
| SCG failure information |  | *SCGFailureInformation* | NA |  |
| NR SCG failure information |  | *SCGFailureInformationNR* | NA |  |
| Sidelink UE information |  | *SidelinkUEInformation* | NA |  |
| WLAN Connection Status Reporting |  | *WLANConnectionStatusReport* | NA |  |
| Delay Budget Report |  | *DelayBudgetReport* | NA |  |
| PUR Configuration Request |  | *PURConfigurationRequest* | NA |  |

Table 11.2-2: UE performance requirements for RRC procedures for NB-IoT UEs

| **Procedure title:** | **E-UTRAN -> UE** | **UE -> E-UTRAN** | **N** | **Notes** |
| --- | --- | --- | --- | --- |
| **RRC Connection Control Procedures** | | | | |
| RRC connection establishment | *RRCConnectionSetup-NB or RRCConnectionResume-NB* | *RRCConnectionSetupComplete-NB or RRCConnectionResumeComplete-NB* | 45 |  |
| RRC connection release | *RRCConnectionRelease-NB* |  | NA |  |
| RRC connection re-configuration (radio resource configuration) | *RRCConnectionReconfiguration-NB* | *RRCConnectionReconfigurationComplete-NB* | 45 |  |
| RRC connection re-establishment | *RRCConnectionReestablishment-NB* | *RRCConnectionReestablishmentComplete-NB* | 45 |  |
| Initial security activation | *SecurityModeCommand* | *SecurityModeCommandComplete/SecurityModeCommandFailure* | 35 |  |
| Initial security activation + RRC connection re-configuration (RB establishment) | *SecurityModeCommand, RRCConnectionReconfiguration-NB* | *RRCConnectionReconfigurationComplete-NB* | 55 | The two DL messages are transmitted in the same TTI |
| EDT or transmission using PUR | *RRCEarlyDataComplete-NB* or *RRCConnectionRelease-NB* for UP-EDT or UP transmission using PUR |  | NA |  |
| Paging | *Paging-NB* |  | NA |  |
| **Other procedures** | | | | |
| UE capability transfer | *UECapabilityEnquiry-NB* | *UECapabilityInformation-NB* | 35 |  |
| UE information | *UEInformationRequest-NB* | *UEInformationResponse-NB* | 45 |  |
| PUR Configuration Request |  | *PURConfigurationRequest-NB* | NA |  |

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| Next change |

## A.6 Protection of RRC messages (informative)

The following list provides information which messages can be sent (unprotected) prior to security activation and which messages can be sent unprotected after security activation. Those messages indicated "-" in "P" column should never be sent unprotected by eNB or UE. Further requirements are defined in the procedural text.

P…Messages that can be sent (unprotected) prior to security activation

A - I…Messages that can be sent without integrity protection after security activation

A - C…Messages that can be sent unciphered after security activation

NA… Message can never be sent after security activation

| Message | P | | A-I | A-C | Comment |
| --- | --- | --- | --- | --- | --- |
| CSFBParametersRequestCDMA2000 | **+** | | **-** | **-** |  |
| CSFBParametersResponseCDMA2000 | + | | - | - |  |
| CounterCheck | - | | - | - |  |
| CounterCheckResponse | - | | - | - |  |
| DelayBudgetReport | - | | - | - |  |
| DLDedicatedMessageSegment | NOTE 1 | | | | |
| DLInformationTransfer | + | | - | - |  |
| FailureInformation | - | | - | - |  |
| HandoverFromEUTRAPreparationRequest (CDMA2000) | - | | - | - |  |
| InDeviceCoexIndication | - | | - | - |  |
| InterFreqRSTDMeasurementIndication | - | | - | - |  |
| LoggedMeasurementsConfiguration | | - | - | - |  |
| MasterInformationBlock | + | | + | + |  |
| MasterInformationBlock-MBMS | + | | + | + |  |
| MBMSCountingRequest | + | | + | + |  |
| MBMSCountingResponse | - | | - | - |  |
| MBMSInterestIndication | + | | - | - |  |
| MBSFNAreaConfiguration | + | | + | + |  |
| MeasReportAppLayer | - | | - | - |  |
| MeasurementReport | - | | - | - | Measurement configuration may be sent prior to security activation. But: In order to protect privacy of UEs, MEASUREMENT REPORT is only sent from the UE after successful security activation. |
| MCGFailureInformation | - | | - | - |  |
| MobilityFromEUTRACommand | - | | - | - |  |
| Paging | + | | + | + |  |
| ProximityIndication | - | | - | - |  |
| PURConfigurationRequest | + | | - | - | For UE using the Control plane CIoT EPS/5GS optimisation, the message is sent unprotected. Otherwise, the message is only sent from the UE after successful security activation. |
| RNReconfiguration | - | | - | - |  |
| RNReconfigurationComplete | - | | - | - |  |
| RRCConnectionReconfiguration | + | | - | - | The message shall not be sent unprotected before security activation if it is used to perform handover or to establish SRB2, SRB4 and DRBs |
| RRCConnectionReconfigurationComplete | + | | - | - | Unprotected, if sent as response to RRCConnectionReconfiguration which was sent before security activation |
| RRCConnectionReestablishment | - | | + | + | This message is not protected by PDCP operation. |
| RRCConnectionReestablishmentComplete | - | | - | - |  |
| RRCConnectionReestablishmentReject | - | | + | + | One reason to send this may be that the security context has been lost, therefore sent as unprotected. |
| RRCConnectionReestablishmentRequest | - | | - | + | This message is not protected by PDCP operation. However, a short MAC-I is included. |
| RRCConnectionReject | + | | + | + | Except for resumption of an RRC connection after early security reactivation in accordance with conditions in 5.3.3.18, A-I and A-C are NA. |
| RRCConnectionRelease | + | | - | - | Justification for P: If the RRC connection only for signalling not requiring DRBs or ciphered messages, or the signalling connection has to be released prematurely, this message is sent as unprotected.  For resumption of an RRC connection after early security reactivation in accordance with conditions in 5.3.3.18, the message is only sent after successful security activation.  *RRCConnectionRelease* message sent before security activation cannot include *rrc-InactiveConfig, redirectedCarrierInfo, idleModeMobilityControlInfo* information fields when UE is connected to 5GC. |
| RRCConnectionRequest | + | | NA | NA |  |
| RRCConnectionResume | - | | - | + | When this message is transmitted, security is activated but suspended. Integrity verification is done after the message received by RRC.  For resumption of an RRC connection after early security reactivation in accordance with conditions in 5.3.3.18, the message is only sent after successful security activation.  For RRC\_INACTIVE state or after early security reactivation, the message is protected with both integrity and ciphering. |
| RRCConnectionResumeRequest | - | | - | + | This message is not protected by PDCP operation. However, a short MAC-I is included. |
| RRCConnectionResumeComplete | - | | - | - |  |
| RRCConnectionSetup | + | | NA | NA |  |
| RRCConnectionSetupComplete | + | | NA | NA |  |
| RRCEarlyDataRequest | + | | NA | NA |  |
| RRCEarlyDataComplete | + | | NA | NA |  |
| SCGFailureInformation | - | | - | - |  |
| SCGFailureInformationNR | - | | - | - |  |
| SCPTMConfiguration | + | | + | + |  |
| SecurityModeCommand | + | | NA | NA | Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC) |
| SecurityModeComplete | - | | NA | NA | Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure. |
| SecurityModeFailure | + | | NA | NA | Neither integrity protection nor ciphering applied. |
| SidelinkUEInformation | + | | - | - |  |
| SystemInformation | + | | + | + |  |
| SystemInformationBlockType1 | + | | + | + |  |
| SystemInformationBlockType1-MBMS | + | | + | + |  |
| UEAssistanceInformation | - | | - | - |  |
| UECapabilityEnquiry | + | | - | - | Except if the UE is using Control plane CIoT EPS optimisation, E-UTRAN should retrieve UE capabilities only after AS security activation. |
| UECapabilityInformation | + | | - | - |  |
| UEInformationRequest | - | | - | - |  |
| UEInformationResponse | - | | - | - | In order to protect privacy of UEs, UEInformationResponse is only sent from the UE after successful security activation |
| ULDedicatedMessageSegment | + | | - | - |  |
| ULHandoverPreparationTransfer (CDMA2000) | - | | - | - | This message should follow HandoverFromEUTRAPreparationRequest |
| ULInformationTransfer | + | | - | - |  |
| ULInformationTransferIRAT | + | | - | - |  |
| ULInformationTransferMRDC | - | | - | - |  |
| WLANConnectionStatusReport | - | | - | - |  |
| NOTE 1: This message type carries segments of other RRC messages. The protection of an instance of this message is the same as for the message which this message is carrying. | | | | | |