**3GPP TSG-RAN WG2 Meeting #107bis *R2-1912538***

**Chongqing, China, 14 – 18 Oct 2019**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **38.331** | **CR** | **CRnum** | **rev** | **-** | **Current version:** | **15.6.0** |  |
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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:***  | Running CR for 38.331 for CA&DC enh |
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| ***Source to WG:*** | Rapporteur (Ericsson) |
| ***Source to TSG:*** | RAN2 |
|  |  |
| ***Work item code:*** | LTE\_NR\_DC\_CA\_enh-Core |  | ***Date:*** | 2019-10-03 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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 canbe 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:*** | To capture the RAN2 agreements on LTE\_NR\_DC\_CA\_enh-Core WI:**RAN2#105 agreements**:*Agreements for fast SCell activation:** The configured SCells (MCG and SCG) can be configured in deactivated or activated state by RRC upon addition or after a handover. Timing requirements are up to RAN4. FFS if this applies to resume.”

*Agreements for MCG fast recovery:** MCG failure can be indicated to the network via the SCG. FFS if via SCells.

**RAN2#105bis agreements**:*Agreements for early measurements:** For NR IDLE mode, the LTE rel-15 euCA early measurement reporting solution (i.e. via UEInformationRequest and UEInformationResponse like messages) after connection is setup will be supported.
* For NR INACTIVE mode, the LTE rel-15 euCA early measurement reporting solution (i.e. via UEInformationRequest and UEInformationResponse like messages) after connection is resumed will be supported.
* For NR INACTIVE, the network can request early measurement report in RRCResume
* For NR INACTIVE, early measurement reporting can be sent in RRCResumeComplete
* NR early measurements can be configured in both NR RRCRelease message and NR system information
* To control the duration of UE performing both IDLE and INACTIVE measurements, a single validity timer (similar to measIdleDuration in LTE euCA) is mandatory indicated only in NR RRCRelease message i.e. not included in NR SIB

*Agreements for MCG fast recovery:** MCG fast recovery targets all MRDC architecture options
* When MCG failure occurs, UE follows SCG failure-like procedure:

 i. UE does not trigger RRC connection re-establishment.  ii. UE triggers an MCG failure procedure in which a failure  information message is transmitted to the network via SCG.* MCG fast recovery targets the following use cases MCG leg RLF
* MCG fast recovery can only be triggered after AS security has been activated and the SRB2 and at least one DRB have been setup *(rapporteur note: SCG is not available before AS security has been setup, so this need not be explicitly stated in specification)*
* MCG failure indication should include:

 i. Available measurement results of MCG ii. MCG link failure cause iii. Available measurement results of SCG iv. Available measurement results of non-serving cells* For MCG failure indication, new RRC message in introduced, e.g. MCGFailureInformation.
* SCG leg of the split SRB1 can be used for MCG fast recovery.

 **RAN2#106 agreements**:*Agreements for early measurements:** A single early measurement configuration is provided in SI for idle and inactive

*Agreements for MCG fast recovery:** Once the MCG failure indication is triggered, the UE shall:- transmit the MCG failure indication;- suspend MCG transmission for all SRBs and DRBs;- reset MCG-MAC;- maintain the current measurement configurations from both the MN and the SN, and continue measurements based on configuration from the MN and the SN if possible..
* If SCG failure is detected while MCG is suspended then initiate RRC re-establishment procedure
* Upon reception of reconfig with sync the UE resumes MCG transmission if suspended

**RAN2#107 agreements***Agreements for early measurements:** For per-frequency SSB measurement configuration reuse the IE structure that is currently used in SIBs for cell reselection purposes.
* The legacy SSB measurement configurations in NR SIB2/4 and LTE SIB24 are reused for NR early measurements performed in frequencies which are candidates of cell selection/reselection, i.e. not introduce new measurement configurations in NR/LTE SIB for these SSBs.
* Same as LTE euCA, NR frequency list (not the SSB measurement configuration) can be different between RRC release and SIB. The frequency list, if provided, in RRC release message overrides the one provided in SIB.
* For per frequency SSB measurement configuration for purpose of only early measurements, it can be included in both RRC release message and SIB. If provided in RRC release message, it overrides the one provided in SIB in the cell where the RRC Release message is received.
* As in LTE euCA, the indication whether to report RSRP, RSRQ or both can be indicated in both RRC release message and SIB. If provided in RRC release, it overrides the one in SIB.
* Similar to LTE euCA, the indication of beam reporting type (i.e. whether to, not report beam results, report only the beam index, or report both beam index and results) can be indicated in both RRC release message and SIB. If provided in RRC release, it overrides the one in SIB.
* NR early measurement configuration is included in a new NR SIB.
* NR early measurement configuration is included in LTE SIB5 (i.e. the SIB including LTE early measurement configurations)
* It is not necessary to specify CSI-RS based early measurements for the case of SCell with SSB in Rel-16.
* It is not necessary to specify CSI-RS based early measurements for the case of SCell without SSB in Rel-16.
* In NR early measurement configuration, the UE can be configured with maximum number for beam reporting and only beams above configured threshold for cell quality derivation are required to be reported (as NR CONNECTED measurements).
* Do not support the network provide information on network’s support of CA/DC between frequencies to assist the UE to determine which frequencies to provide NR early measurement in Rel-16.
* Do not support a mechanism to prevent outdated early measurement reporting in Rel-16
* Upon the reception of the RRCSetup message in response to RRCSetupRequest or RRCResumeRequest (while T331 is running), the UE stops T331, and deletes the dedicated idle mode measurement configuration, if any.
* Upon the reception of the RRCReject message in response to RRCSetupRequest or RRCResumeRequest (while T331 is running), the UE keeps performing the idle mode measurements.
* During a 2-step resume (i.e. RRCRelease in response to RRCResumeRequest), the network can release or reconfigure the idle mode measurements.
* Upon the expiry of T331 while in IDLE or INACTIVE mode, the UE deletes the dedicated idle mode measurement configuration, if any.
* The UE deletes the early measurement results after it has successfully reported them to the network (i.e. in UEInformationResponse or RRCResumeComplete).

*Agreements for MCG SCell and SCG configuraiton with RRC Resume:** The LTE RRCConnectionResume message (Inactive to Connected) can contain the MCG SCell configuration and the associated UE behaviour in handling the SCell configuration is the same as in the Rel-15 RRC connection reconfiguration procedure.
* In NR and LTE Rel-16, the UE maintains the MCG SCell configuration upon the initiation of the resume procedure.
* The RRC(Connection)Resume message contains an indication to restore/resume the MCG SCells (noting that behaviour in legacy eNBs that don't support this feature needs to be considered).
* The (LTE and NR) RRC(Connection)Resume (Inactive to Connected))message can contain the SCG configuration and the associated UE behaviour in handling the SCG configuration is the same as in the Rel-15 RRC (connection) reconfiguration procedure.
* In NR and LTE Rel-16, the UE maintains the SCG configuration upon the initiation of the resume procedure.
* The RRC(Connection)Resume message contains an indication to restore/resume the SCG (noting that behaviour in legacy e/gNBs that don't support this feature needs to be considered).

*Agreements for MCG fast recovery:** Upon sending a MCG failure indication, UE starts a timer.
* Upon resumption of MCG, UE stops the timer.
* Upon expiry of the timer, UE initiates RRC connection re-establishment procedure.
* Network can configure the timer value (no infinite value)
* If a UE is configured with split SRB1 with PDCP duplication, there is no need to switch the primaryPath upon detection of MCG failure since MCG failure indication will be transmitted via SCG RLC bearer of split SRB1.
* If PDCP duplication is not activated, upon detection of MCG failure the primaryPath for split SRB1 is implicitly reconfigured to the SCG. The UE expects the network to explicitly reconfigure the primaryPath back to MCG in the MCG recovery or in a Re-establishment
* SRB3, if configured, can be used for MCG fast recovery.
* For MCG fast recovery via SRB3, MCG Failure Information message in UL (same message as for SRB1 case) is encapsulated by the UE into an SN RRC message.
* For MCG fast recovery via SRB3, the MN response message in DL (either a reconfiguration with sync or release message) is encapsulated by the SN in an SN RRC message.
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| ***Summary of change:*** | **After RAN2#105bis:*** Added procedures and ASN.1 to enable SCells to be configured in deactivated o activated state upon addition or after handover. (5.3.5.5.2, 5.3.5.5.9, 6.3.2)
* Added placeholder for idle/inactive measurement (5.7.x)

**After RAN2#106:*** Modified the RRC Setup procedure to make it possible for the UE to indicate the availability of early measurement results in the *RRCResumeComplete* message (5.3.3.4)
* Added that MCG transmission will be resumed on reception RRC reconfiguration with sync (5.3.5.5.2)
* Modified the Inability to comply with RRC Reconfiguartion procedure so that SCG failure information procedure is triggered only if MCG is not suspended, otherwise re-establishement is triggered (5.3.5.8.2)
* Modified the Reconfiguration with sync failure procedure so that SCG failure information procedure is triggered only if MCG is not suspended, otherwise re-establishement is triggered (5.3.5.8.3)
* Modified the RRC Release procedure to include configuring the UE with early measurements (5.3.8.3)
* Modified the radio link failure detection procedure to trigger MCG failure information procedure on MCG RLF, and trigger re-establishment upon SCG RLF if MCG was suspended (5.3.10.3)
* Modified the RRC Resume procedure to make it possible for the UE to include early measurement results in the *RRCResumeComplete* message if the network has requested that in the *RRCResume*, or otherwise indicate the availability of the early measurements (5.3.13.4)
* Clarified that SCG failure information procedure is triggered only if MCG is not suspended (5.7.3.1)
* Added MCG failure information procedure (5.7.y)
* Added UE Information procedure (5.7.z)
* Added the *ueInformationRequest* message structure in *DL-DCCH-Message* (6.2.1)
* Added the *mcgFailureInformation* and *ueInformationResponse* message structures in *UL-DCCH-Message* (6.2.1)
* Added ASN.1 for *MCGFailureInformation* (6.2.2)
* Modified ASN.1 for *RRCRelease* to include idle meas configuraiton(6.2.2)
* Modified ASN.1 for *RRCResume* to include early measurement request(6.2.2)
* Modified ASN.1 for *RRCResumeComplete* to include early measurement availability indication or early measurement results(6.2.2)
* Modified ASN.1 for *RRCSetupComplete* to include early measurement availability indication (6.2.2)
* Added ASN.1 for *UEInformationRequest* (6.2.2)
* Added ASN.1 for *UEInformationResponse* (6.2.2)
* Added ASN.1 for *MeasIdleConfig* (6.3.2)
* Added a placeholder for the *measIdleDuration* timer in the timers descriptions (7.1.1.)
* Added the UE variables *varMeasIdleConfig* and *varMeasIdleReport* (7.4)

**After RAN2#107:*** Modified RRC connection establishment procedures to stop T331 and release VarMeasIdleConfig upon reception of *RRCSetup* message
* Modified initiation of RRC Resume procedures to only release MR-DC if UE doesn’t support restoring SCG in RRCResume
* Modified initiation of RRC Resume procedures to only release MCG SCells if UE doesn’t support restoring MCG SCells in *RRCResume*
* Modified procedures for reception of *RRCResume* to release MR-DC if *RRCResume* doesn’t include *restoreSCG*
* Added procedures to reception of *RRCResume* to configure SCG with *RRCResume*
* Modified procedures for reception of *RRCResume* to release MCG SCells if *RRCResume* doesn’t include *restoreMCG-SCells*
* Added note to procedures for reception of *RRCReject* stating that the UE continues to perform idle mode measurements while T331 is running.
* Added procedures for T331 expiry
* Added procedure and ASN.1 for new SIB containing broadcast early measurement configuration.
* Modified ASN-1 to add new DL-DCCH message (*DLInformationTransferMRDC*) to carry the MN response to MCGFailure via SRB3
* Modified ASN.1 to update condition of measIdleConfig in RRCRelease from Need FFS to Need M
* Modified ASN.1 for *RRCResume* to inlcude indication to restore MCG SCells
* Modified ASN.1 for *RRCResume* to inlcude indication to restore SCG
* Modified ASN.1 for *RRCResume* to inlcude configuraitons for SCG
* Modified ASN.1 for *ULInformationTransferMRDC* to inlcude *MCGFailureInformation* message in UL-DCCH-Message and allow it to be sent via SRB3
* Modified ASN.1 to add UE capability to support keeping MCG SCells during RRC Resume
* Modified ASN.1 to add UE capability to support keeping SCG during RRC Resume
* Added procedure and ASN.1 for measurement results in *MCGFailureInformation* message
* Added clarification that UE continues idle mode measurements if it receives an *RRCReject* message
* Added indication about NW support for idle mode measurements to SIB1
* Added measurement configuration details (for NR and E-UTRA) to *MeasIdleConfig*
* Added MeasResultListIdle containing the Rel-16 idle mode measurement results
* Extended UE variables with idle mode measurement variables
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| ***Consequences if not approved:*** |  |
|  |  |
| ***Clauses affected:*** | 5.2.2.4.x Actions upon reception of SIBx5.3.3.4 Reception of RRCSetup by the UE5.3.5.5.2 Reconfiguration with sync5.3.5.5.9 SCell Addition/Modification5.3.5.8.2 Inability to comply with RRCReconfiguration5.3.5.8.3 T304 expiry (Reconfiguration with sync Failure)5.3.8.3 Reception of the RRCRelease by the UE5.3.10.3 Detection of radio link failure5.3.13.2 Initiation5.3.13.4 Reception of the RRCResume by the UE5.3.15.2 Reception of the RRCReject by the UE5.3.7 RRC connection re-establishment5.7.2a UL Information transfer for MR-DC5.7.2y DLinformation transfer for MR-DC5.7.3 SCG failure information5.7.x Idle/Inactive measurements 5.7.y MCG failure information5.7.z UE Information6.2.1 General message structure (*DL-DCCH-Message, UL-DCCH-Message*)6.2.2 Message definitions (*DLInformationTransferMRDC*, *MCGFailureInformation, RRCRelease, RRCResume, RRCResumeComplete, RRCSetupComplete,* SIB1, *UEInformationRequest, UEInformationResponse, ULInformationTransferMRDC*)6.3.1 System information blocks (*SIBx*)6.3.2 Radio resource control information elements (*cellGroupConfig, MeasIdleConfig, MeasResultListIdle (new), MeasResultMCG-Failure*)6.3.3 UE capability Information elements (*UE-MRDC-Capability*)6.4 RRC multiplicity and type constraint values (*Multiplicity and type constraint definitions*)7.1.1 Timers (Informative)7.4 UE variables (*VarMeasIdleConfig, VarMeasIdleReport*) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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# 5 Procedures

## 5.2 System information

### 5.2.2 System information acquisition

#### 5.2.2.4 Actions upon receipt of System Information

##### 5.2.2.4.x Actions upon reception of *SIBx*

Editor’s note: FFS how to handle idle mode measurement configurations in SIBx and *RRCRelease;* and measurement configurations in SIB2/4/5.

*END OF CHANGES*

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## 5.3 Connection control

### 5.3.3 RRC connection establishment

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

The UE shall perform the following actions upon reception of the *RRCSetup*:

1> if the *RRCSetup* is received in response to an *RRCReestablishmentRequest*; or

1> if the *RRCSetup* is received in response to an *RRCResumeRequest* or *RRCResumeRequest1*:

2> discard any stored UE Inactive AS context and *suspendConfig*;

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;

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

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

2> stop timer T380, if running;

1> perform the cell group configuration procedure in accordance with the received *masterCellGroup* and as specified in 5.3.5.5;

1> perform the radio bearer configuration procedure in accordance with the received *radioBearerConfig* and as specified in 5.3.5.6;

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

1> stop timer T300, T301 or T319 if running;

1> if T390 is running:

2> stop timer T390 for all access categories;

2> perform the actions as specified in 5.3.14.4;

1> if T302 is running:

2> stop timer T302;

2> perform the actions as specified in 5.3.14.4;

1> stop timer T320, if running;

1> if the *RRCSetup* is received in response to an *RRCResumeRequest*, *RRCResumeRequest1* or *RRCSetupRequest*:

2> stop timer T331, if running;

2> release the *VarMeasIdleConfig*, if any;

2> enter RRC\_CONNECTED;

2> stop the cell re-selection procedure;

1> consider the current cell to be the PCell;

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

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

3> if the *RRCSetup* is received in response to an *RRCSetupRequest*:

4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI-Part2*;

3> else:

4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI*;

2> set the *selectedPLMN-Identity* to the PLMN selected by upper layers (TS 24.501 [23]) from the PLMN(s) included in the *plmn-IdentityList* in *SIB1*;

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

3> include and set the *registeredAMF* as follows:

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

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

4> set the *amf-Identifier* to the value received from upper layers;

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 [21]):

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

2> set the *dedicatedNAS-Message* to include the information received from upper layers;

2> if the SIB1 contains *idleModeMeasurements* and if the UE has IDLE mode measurement information available in *VarMeasIdleReport*:

3> include the *idleMeasAvailable*;

1> submit the RRCSetupComplete message to lower layers for transmission, upon which the procedure ends

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### 5.3.5 RRC reconfiguration

#### 5.3.5.5 Cell Group configuration

##### 5.3.5.5.2 Reconfiguration with sync

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the AS security is not activated, perform the actions upon going to RRC\_IDLE as specified in 5.3.11 with the release cause '*other*' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

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

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

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

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

NOTE 2: The UE may omit reading the *MIB* if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> for each SCell of this cell group, if configured:

2> if the received *RRCReconfiguration* message includes the *sCellState* for the SCell and indicates *activated*:

3> configure lower layers to consider the SCell to be in activated state;

2> else:

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

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

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

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

1> if this cell group is the MCG:

2> stop timer T316, if running;

2> resume MCG transmission, if suspended.

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##### 5.3.5.5.9 SCell Addition/Modification

The UE shall:

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

2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;

2> if the *sCellState* is configured for the SCell and indicates *activated*:

3> configure lower layers to consider the SCell to be in activated state;

2> else:

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

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

3> if SCells are not applicable for the associated measurement; and

3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:

4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

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

2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

END OF CHANGES

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#### 5.3.5.8 Reconfiguration failure

5.3.5.8.2 Inability to comply with RRCReconfiguration

The UE shall:

1> if the UE is in (NG)EN-DC:

2> if the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message received over SRB3;

3> continue using the configuration used prior to the reception of *RRCReconfiguration* message;

3> if MCG transmission is not suspended:

4> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration error, upon which the connection reconfiguration procedure ends;

3> else:

4> initiate the connection re-establishment procedure as specified in TS 36.331 [10], clause 5.3.7;

2> else, if the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message received over SRB1;

3> continue using the configuration used prior to the reception of *RRCReconfiguration* message;

3> initiate the connection re-establishment procedure as specified in TS 36.331 [10], clause 5.3.7, upon which the connection reconfiguration procedure ends.

1> else if *RRCReconfiguration* is received via NR (i.e., NR standalone, NE-DC, or NR-DC):

2> if the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message received over SRB3;

NOTE 0: This case does not apply in NE-DC.

3> continue using the configuration used prior to the reception of *RRCReconfiguration* message;

3> if MCG transmission is not suspended:

4> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration error, upon which the connection reconfiguration procedure ends;

3> else:

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

2> else if the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message received over the SRB1;

NOTE 0a: The compliance also covers the SCG configuration carried within octet strings e.g. field *mrdc-SecondaryCellGroupConfig*. I.e. the failure behaviour defined also applies in case the UE cannot comply with the embedded SCG configuration or with the combination of (parts of) the MCG and SCG configurations.

3> continue using the configuration used prior to the reception of *RRCReconfiguration* message;

3> if AS security has not been activated:

4> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'other'

3> else if AS security has been activated but SRB2 and at least one DRB have not been setup:

4> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

3> else:

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

1> else if *RRCReconfiguration* is received via other RAT (Handover to NR failure):

2> if the UE is unable to comply with any part of the configuration included in the *RRCReconfiguration* message:

3> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT.

NOTE 1: The UE may apply above failure handling also in case the *RRCReconfiguration* message causes a protocol error for which the generic error handling as defined in clause 10 specifies that the UE shall ignore the message.

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

5.3.5.8.3 T304 expiry (Reconfiguration with sync Failure)

The UE shall:

1> if T304 of the MCG expires:

2> release dedicated preambles provided in *rach-ConfigDedicated* if configured;

2> revert back to the UE configuration used in the source PCell;

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

NOTE 1: In the context above, "the UE configuration" includes state variables and parameters of each radio bearer.

1> else if T304 of a secondary cell group expires:

2> release dedicated preambles provided in *rach-ConfigDedicated,* if configured;

2> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration with sync failure, upon which the RRC reconfiguration procedure ends;

1> else if T304 expires when *RRCReconfiguration* is received via other RAT (HO to NR failure):

2> reset MAC;

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

*END OF CHANGES*

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### 5.3.7 RRC connection re-establishment

#### 5.3.7.2 Initiation

The UE initiates the procedure when one of the following conditions is met:

1> upon detecting radio link failure of the MCG, in accordance with 5.3.10; or

1> upon re-configuration with sync failure of the MCG, in accordance with sub-clause 5.3.5.8.3; or

1> upon mobility from NR failure, in accordance with sub-clause 5.4.3.5; or

1> upon integrity check failure indication from lower layers concerning SRB1 or SRB2, except if the integrity check failure is detected on the *RRCReestablishment* message; or

1> upon an RRC connection reconfiguration failure, in accordance with sub-clause 5.3.5.8.2 ; or

1> upon detecting radio link failure for the SCG while MCG is suspended (i.e. in accordance with subclause 5.3.10.3 in case of NR-DC or in accordance with TS 36.331 [10] subclause 5.3.11.3 in case of NE-DC);

1> upon reconfiguration with sync failure of the SCG while MCG is suspended in accordance with subclause 5.3.5.8.3;

1> upon SCG configuration failure while MCG is suspended (i.e. in accordance with subclause 5.3.5.8.2 in case of NR-DC);

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

Upon initiation of the procedure, the UE shall:

1> stop timer T310, if running;

1> stop timer T304, if running;

1> stop timer T316, if running;

1> start timer T311;

1> suspend all RBs, except SRB0;

1> reset MAC;

1> release the MCG SCell(s), if configured;

1> release *spCellConfig*, if configured;

1> if MR-DC is configured:

2> perform MR-DC release, as specified in section 5.3.5.10;

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

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

1> perform cell selection in accordance with the cell selection process as specified in TS 38.304 [20], clause 5.2.6.

*END OF CHANGES*

START OF CHANGES

### 5.3.8 RRC connection release

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

The UE shall:

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

1> stop timer T380, if running;

1> stop timer T320, if running;

1> stop timer T316, if running;

1> if theAS security is not activated:

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

2> perform the actions upon going to RRC\_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> if the *RRCRelease* message includes *redirectedCarrierInfo* indicating redirection to *eutra*:

2> if *cnType* is included:

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

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

1> if the *RRCRelease* message includes the *cellReselectionPriorities*:

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

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 *deprioritisationReq* is included:

2> start or restart timer T325 with the timer value set to the *deprioritisationTimer* signalled;

2> store the *deprioritisationReq* until T325 expiry;

1> if the *RRCRelease* includes the *measIdleConfig*:

Editor’s note: FFS whether UE shall delete stored *VarMeasIdleConfig* or *VarMeasIdleReport*.

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

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

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

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

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

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

2> start performing idle/inactive measurements asspecified in5.7.x;

Editor’s note: FFS how to handle stored idle mode measurement configurations if *measIdleCarrierListNR* or *measIdleCarrierListEUTRA* are not included.

1> if the *RRCRelease* includes *suspendConfig*:

2> apply the received *suspendConfig*;

2> reset MAC and release the default MAC Cell Group configuration, if any;

2> re-establish RLC entities for SRB1;

2> if the *RRCRelease* message with *suspendConfig* was received in response to an *RRCResumeRequest* or an *RRCResumeRequest1*:

3> stop the timer T319 if running;

3> in the stored UE Inactive AS context:

4> replace the KgNB and KRRCint keys with the current KgNB and KRRCint keys;

4> replace the C-RNTI with the temporary C-RNTI in the cell the UE has received the *RRCRelease* message;

4> replace the *cellIdentity* with the *cellIdentity* of the cell the UE has received the *RRCRelease* message;

4> replace the physical cell identitywith the physical cell identity of the cell the UE has received the *RRCRelease* message;

2> else:

3> store in the UE Inactive AS Context the current KgNB and KRRCint keys, the ROHC state, the C-RNTI used in the source PCell, the *cellIdentity* and the physical cell identity of the source PCell, and all other parameters configured except for the ones within *ReconfigurationWithSync* and *servingCellConfigCommonSIB*;

2> suspend all SRB(s) and DRB(s), except SRB0;

2> indicate PDCP suspend to lower layers of all DRBs;

2> if the *t380* is included:

3> start timer T380, with the timer value set to *t380*;

2> if the *RRCRelease* message is including the *waitTime*:

3> start timer T302 with the value set to the *waitTime*;

3> inform upper layers that access barring is applicable for all access categories except categories '0' and '2';

2> if T390 is running:

3> stop timer T390 for all access categories;

3> perform the actions as specified in 5.3.14.4;

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

2> enter RRC\_INACTIVE and perform cell selection as specified in TS 38.304 [20];

1> else

2> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with the release cause 'other'.

END OF CHANGES

START OF CHANGES

### 5.3.10 Radio link failure related actions

5.3.10.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry in PCell; or

1> upon random access problem indication from MCG MAC while neither T300, T301, T304, T311 nor T319 are running; or

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

2> if the indication is from MCG RLC and CA duplication is configured and activated, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else if UE is configured with split SRB1 or SRB3 and SCG is not suspended and PSCell change is not ongoing (i.e. timer t304 for the NR PSCell is not running in case of NR-DC or timer t307 of the E-UTRA PSCell is not running as specified in TS 36.331 [10], clause 5.3.10.10; in case of NE-DC):

3> initiate the MCG failure information procedure as specified in 5.7.y to report MCG radio link failure.

2> else:

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

3> if AS security has not been activated:

4> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'other';-

3> else if AS security has been activated but SRB2 and at least one DRB have not been setup:

4> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

3> else:

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

The UE shall:

1> upon T310 expiry in PSCell; or

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

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

2> if the indication is from SCG RLC and CA duplication is configured and activated; and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else if MCG transmission is not suspended:

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

3> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

2> else:

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

3> if UE is in NR-DC:

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

3> else (UE is in (NG)EN-DC):

4> initiate the connection re-establishment procedure as specified in TS 36.331 [10], clause 5.3.7;

END OF CHANGES

START OF CHANGES

### 5.3.13 RRC connection resume

#### 5.3.13.2 Initiation

The UE initiates the procedure when upper layers or AS (when responding to RAN paging or upon triggering RNA updates while the UE is in RRC\_INACTIVE) requests the resume of a suspended RRC connection.

The UE shall ensure having valid and up to date essential system information as specified in clause 5.2.2.2 before initiating this procedure.

Upon initiation of the procedure, the UE shall:

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 5.3.14 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 5.3.14 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 RNA update as specified in 5.3.13.8:

2> if an emergency service is ongoing:

NOTE: How the RRC layer in the UE is aware of an ongoing emergency service is up to UE implementation.

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 5.3.14 using the selected Access Category and one or more Access Identities to be applied as specified in TS 24.501 [23];

3> if the access attempt is barred:

4> set the variable *pendingRnaUpdate* to *true*;

4> the procedure ends;

1> if the UE is in NE-DC or NR-DC:

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

3> release the MR-DC related configurations (i.e., as specified in 5.3.5.10) from the UE Inactive AS context, if stored;

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

2> release the MCG SCell(s) from the UE Inactive AS context, if stored;

1> apply the default L1 parameter values as specified in corresponding physical layer specifications, except for the parameters for which values are provided in *SIB1*;

1> apply the default SRB1 configuration as specified in 9.2.1;

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

1> release *delayBudgetReportingConfig* from the UE Inactive AS context, if stored;

1> stop timer T342, if running;

1> release *overheatingAssistanceConfig* from the UE Inactive AS context, if stored;

1> stop timer T345, if running;

1> apply the CCCH configuration as specified in 9.1.1.2;

1> apply the *timeAlignmentTimerCommon* included in *SIB1*;

1> start timer T319;

1> set the variable *pendingRnaUpdate* to *false*;

1> initiate transmission of the *RRCResumeRequest* message or *RRCResumeRequest1* in accordance with 5.3.13.3.

#### 5.3.13.3 Actions related to transmission of *RRCResumeRequest* or *RRCResumeRequest1* message

The UE shall set the contents of *RRCResumeRequest* or *RRCResumeRequest1* message as follows:

1> if field *useFullResumeID* is signalled in *SIB1*:

2> select *RRCResumeRequest1* as the message to use;

2> set the *resumeIdentity* to the stored *fullI-RNTI* value;

1> else:

2> select *RRCResumeRequest* as the message to use;

2> set the *resumeIdentity* to the stored *shortI-RNTI* value;

1> restore the RRC configuration and the KgNB and KRRCint keys from the stored UE Inactive AS context except the *masterCellGroup* and *pdcp-Config*;

1> set the *resumeMAC-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) *VarResumeMAC-Input*;

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

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

1> derive the KgNB key based on the current KgNB key or the NH, using the stored *nextHopChainingCount* value, as specified in TS 33.501 [11];

1> derive the KRRCenc key, the KRRCint key, the KUPint key and the KUPenc key;

1> configure lower layers to apply integrity protection for all radio bearers except SRB0 using the configured algorithm and the KRRCint key and KUPint key derived in this subclause immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE;

NOTE 1: Only DRBs with previously configured UP integrity protection shall resume integrity protection.

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

1> re-establish PDCP entities for SRB1;

1> resume SRB1;

1> submit the selected message *RRCResumeRequest* or *RRCResumeRequest1* for transmission to lower layers.

NOTE 2: Only DRBs with previously configured UP ciphering shall resume ciphering.

If lower layers indicate an integrity check failure while T319 is running, perform actions specified in 5.3.13.5.

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

#### 5.3.13.4 Reception of the *RRCResume* by the UE

The UE shall:

1> stop timer T319;

1> stop timer T380, if running;

1> if the *RRCResume* includes the *fullConfig*:

2> perform the full configuration procedure as specified in 5.3.5.11;

1> else:

2> if the *RRCResume* does not include the *restoreMCG-SCells*:

3> release the MCG SCell(s) from the UE Inactive AS context, if stored;

2> restore the *masterCellGroup* and *pdcp-Config* from the UE Inactive AS context;

1> discard the UE Inactive AS context;

1> release the *suspendConfig* except the *ran-NotificationAreaInfo*;

1> if the *RRCResume* does not include the *restoreSCG*:

2> if the UE is in NE-DC or NR-DC:

3> perform MR-DC release, as specified in clause 5.3.5.10;

1> if the *RRCResume* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

1> if the *RRCResume* includes the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

1> if the *RRCResume* message includes the *sk-Counter*:

2> perform security key update procedure as specified in 5.3.5.7;

1> if the *RRCResume* message includes the *radioBearerConfig2*:

2> perform the radio bearer configuration according to 5.3.5.6;

1> if the *RRCResume* includes the *mrdc-SecondaryCellGroup:*

2> if the received *mrdc-SecondaryCellGroup* is set to *nr-SCG*:

3> perform the RRC reconfiguration according to 5.3.5.3 for the *RRCReconfiguration* message included in *nr-SCG*;

2> if the received *mrdc-SecondaryCellGroup* is set to *eutra-SCG*:

3>perform the RRC connection reconfiguration as specified in TS 36.331 [10], clause 5.3.5.3 for the *RRCConnectionReconfiguration* message included in *eutra-SCG*;

1> resume SRB2 and all DRBs;

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

1> stop timer T320, if running;

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

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

1> resume measurements if suspended;

1> if T390 is running:

2> stop timer T390 for all access categories;

2> perform the actions as specified in 5.3.14.4;

1> if T302 is running:

2> stop timer T302;

2> perform the actions as specified in 5.3.14.4;

1> enter RRC\_CONNECTED;

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

1> stop the cell re-selection procedure;

1> consider the current cell to be the PCell;

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

2> if the upper layer provides NAS PDU, set the *dedicatedNAS-Message* to include the information received from upper layers;

2> if the upper layer provides a PLMN, set the *selectedPLMN-Identity* to PLMN selected by upper layers (TS 24.501 [23]) from the PLMN(s) included in the *plmn-IdentityList* in *SIB1;*

2> if the *masterCellGroup* contains the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList* for each serving cell with UL;

3> if UE is configured with SUL carrier:

4> include *uplinkDirectCurrentBWP-SUL* for each serving cell with SUL within the *uplinkTxDirectCurrentList*;

2> if the UE has IDLE mode measurement information available in *VarMeasIdleReport*:

3> if the *idleModeMeasurementReq* is included in the *RRCResume* message:

4> set the *measResultListIdle* in the *RRCResumeComplete* message to the value of *measReportIdle* in the *VarMeasIdleReport*;

3> else, if the SIB1 contains *idleModeMeasurements*:

4> include the *idleMeasAvailable*;

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

1> the procedure ends.

END OF CHANGES

*START OF CHANGES*

### 5.3.15 RRC connection reject

#### 5.3.15.1 Initiation

The UE initiates the procedure upon the reception of *RRCReject* when the UE tries to establish or resume an RRC connection.

#### 5.3.15.2 Reception of the *RRCReject* by the UE

The UE shall:

1> stop timer T300, if running;

1> stop timer T319, if running;

1> stop timer T302, if running;

1> reset MAC and release the default MAC Cell Group configuration;

1> if *waitTime* is configured in the *RRCReject*:

2> start timer T302, with the timer value set to the *waitTime*;

1> if *RRCReject* is received in response to a request from upper layers:

2> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2';

1> if *RRCReject* is received in response to an *RRCSetupRequest*:

2> inform upper layers about the failure to setup the RRC connection, upon which the procedure ends;

1> else if *RRCReject* is received in response to an *RRCResumeRequest* or an *RRCResumeRequest1*:

2> if resume is triggered by upper layers:

3> inform upper layers about the failure to resume the RRC connection;

2> if resume istriggered due to an RNA update:

3> set the variable *pendingRnaUpdate* to *true*;

2> discard the current KgNB key, the KRRCenc key, the KRRCint key, the KUPint key and the KUPenc key derived in accordance with 5.3.13.3;

2> suspend SRB1, upon which the procedure ends;

The RRC\_INACTIVE UE shall continue to monitor paging while the timer T302 is running.

NOTE: If configured, the UE shall continue to perform idle mode measurements while the timer T331 is running.

END OF CHANGES

*START OF CHANGES*

## 5.7 Other

### 5.7.2a UL information transfer for MR-DC

#### 5.7.2a.1 General



Figure 5.7.2a.1-1: UL information transfer MR-DC

The purpose of this procedure is to transfer MR-DC dedicated information from the UE to the network e.g. the NR or E-UTRA RRC *MeasurementReport,* *FailureInformation*, or *MCGFailureInformation* message message.

#### 5.7.2a.2 Initiation

A UE in RRC\_CONNECTED initiates the UL information transfer for MR-DC procedure whenever there is a need to transfer MR-DC dedicated information. I.e. the procedure is not used during an RRC connection reconfiguration involving NR or E-UTRA connection reconfiguration, in which case the MR DC information is piggybacked to the *RRCReconfigurationComplete* message.

#### 5.7.2a.3 Actions related to transmission of *ULInformationTransferMRDC* message

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

1> if there is a need to transfer MR-DC dedicated information related to NR:

2> set the *ul-DCCH-MessageNR* to include the NR MR-DC dedicated information to be transferred (e.g., NR RRC *MeasurementReport,*  *FailureInformation,* or *MCGFailureInformation* message);

1> else if there is a need to tranfer MR-DC dedicated information related to E-UTRA:

2> set the *ul-DCCH-MessageEUTRA* to include the E-UTRA MR-DC dedicated information to be transferred (e.g., E-UTRA RRC *MeasurementReport, FailureInformation,* or *MCGFailureInformation* message);

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

5.7.3 SCG failure information

5.7.3.1 General

****

**Figure 5.7.3.1-1: SCG failure information**

The purpose of this procedure is to inform E-UTRAN or NR MN about an SCG failure the UE has experienced i.e. SCG radio link failure, failure of SCG reconfiguration with sync, SCG configuration failure for RRC message on SRB3 and SCG integrity check failure.

5.7.3.2 Initiation

A UE initiates the procedure to report SCG failures when neither MCG nor SCG transmission is suspended and when one of the following conditions is met:

1> upon detecting radio link failure for the SCG, in accordance with subclause 5.3.10.3;

1> upon reconfiguration with sync failure of the SCG, in accordance with subclause 5.3.5.8.3;

1> upon SCG configuration failure, in accordance with subclause 5.3.5.8.2;

1> upon integrity check failure indication from SCG lower layers concerning SRB3.

Upon initiating the procedure, the UE shall:

1> suspend SCG transmission for all SRBs and DRBs;

1> reset SCG MAC;

1> stop T304, if running;

1> if the UE is in (NG)EN-DC:

2> initiate transmission of the *SCGFailureInformationNR* message as specified in TS 36.331 [10], clause 5.6.13a.

1> else:

2> initiate transmission of the *SCGFailureInformation* message in accordance with 5.7.3.5.

*END OF CHANGES*

START OF CHANGES

### 5.7.x Idle/inactive Measurements

#### 5.7.x.1 General

This procedure specifies the measurements done by a UE in RRC\_IDLE and RRC\_INACTIVE when it has an idle mode measurement configuration and the storage of the available measurements by a UE in RRC\_IDLE, RRC\_INACTIVE, and RRC\_CONNECTED.

Editor’s Note: Details on this behavior are FFS and can be captured in this clause.

#### 5.7.x.2 Initiation

Editor’s Note: Details on this behavior are FFS and can be captured in this clause.

#### 5.7.x.3 T331 expiry

The UE shall:

1> if T331 expires:

2> release the *VarMeasIdleConfig*;

END OF CHANGES

START OF CHANGES

5.7.y MCG failure information

5.7.y.1 General

****

**Figure 5.7.y.1-1: MCG failure information**

The purpose of this procedure is to inform NR MN about an MCG failure the UE has experienced i.e. MCG radio link failure. A UE in RRC\_CONNECTED, for which AS security has been activated with SRB2 and at least one DRB setup, may initiate the procedure in order to continue the RRC connection without re-establishment.

5.7.y.2 Initiation

A UE configured with split SRB1 or SRB3 initiates the procedure to report MCG failures when neither MCG nor SCG transmission is suspended and when the following condition is met:

1> upon detecting radio link failure of the MCG, in accordance with 5.3.10.3

Upon initiating the procedure, the UE shall:

1> suspend MCG transmission for all SRBs and DRBs;

1> reset MCG-MAC;

1> initiate transmission of the *MCGFailureInformation* message in accordance with 5.7.y.4.

5.7.y.3 Failure type determination

The UE shall set the MCG failure type as follows:

1> if the UE initiates transmission of the *MCGFailureInformation* message due to T310 expiry:

2> set the *failureType* as *t310-Expiry*;

1> else if the UE initiates transmission of the *MCGFailureInformation* message to provide random access problem indication from MCG MAC:

2> set the *failureType* as *randomAccessProblem*;

1> else if the UE initiates transmission of the *MCGFailureInformation* message to provide indication from MCG RLC that the maximum number of retransmissions has been reached:

2> set the *failureType* as *rlc-MaxNumRetx*;

#### 5.7.y.4 Actions related to transmission of *MCGFailureInformation* message

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

1> include and set *failureType* in accordance with 5.7.y.3;

Editor’s Note: Details on how to populate the NR results in *measResultFreqList* are FFS.

1> if the UE is in NR-DC;

2> include and set *MeasResultSCG* in accordance with 5.7.3.4;

1> if the UE is in NE-DC;

2> for each EUTRA frequency the UE is configured to measure by measConfig for which measurement results are available:

3> set the measResultFreqListEUTRA to include the best measured cells, ordered such that the best cell is listed first using RSRP to order if RSRP measurement results are available for cells on this frequency, otherwise using RSRQ to order if RSRQ measurement results are available for cells on this frequency, otherwise using SINR to order, and based on measurements collected up to the moment the UE detected the failure, and for each cell that is included, include the optional fields that are available;

2> include and set *MeasResultSCG*-*EUTRA* in accordance with TS 36.331 [10] clause 5.6.13.5;

1> if SRB1 is configured as Split SRB and *pdcp-Duplication* is not configured;

2> if *primaryPath* is set to a cell group ID corresponding to MCG;

3> set *primaryPath* to a cell group ID corresponding to SCG;

Editor’s note: FFS How to capture sending of *MCGFailureInformation* via SRB3

The UE shall:

1. start timer T316;

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

#### 5.7.y.5 T316 expiry

The UE shall:

1> if T316 expires:

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

END OF CHANGES

START OF CHANGES

5.7.z UE Information

5.7.z.1 General



Figure 5.7.z.1-1: UE information procedure

The UE information procedure is used by the network to request the UE to report information.

#### 5.7.z.2 Initiation

The network initiates the procedure by sending the *UEInformationRequest* message. The network should initiate this procedure only after successful security activation.

#### 5.7.z.3 Reception of the *UEInformationRequest* message

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

Editor’s note: Procedures to report idle mode measurements in *UEInformationRequest* are FFS

1> if the *idleModeMeasurementReq* is included in the *UEInformationRequest* and UE has stored *VarMeasIdleReport*:

2> set the *measResultListIdle* in the *UEInformationResponse* message to the value of *measReportIdle* in the *VarMeasIdleReport*;

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

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

END OF CHANGES

START OF CHANGES

5.7.2y DL information transfer for MR-DC

5.7.2y.1 General

****

**Figure 5.7.2y.1-1: DL information transfer MR-DC**

The purpose of this procedure is to transfer MR-DC dedicated information from the network to the UE e.g. the NR or E-UTRA RRC connection reconfiguration or RRC connection release message.

5.7.2y.2 Initiation

The network initiates the DL information transfer for MR-DC procedure whenever there is a need to transfer MR-DC dedicated information. I.e. during an RRC connection reconfiguration (involving NR or E-UTRA connection reconfiguration) or during the NR or E-UTRA RRC connection release.

5.7.2y.3 Actions related to reception of *DLInformationTransferMRDC* message

Upon receiving the *DLInformationTransferMRDC*, the UE shall:

1> if *RRCReconfiguration* is included within *dl-DCCH-MessageNR*:

2> perform the RRC reconfiguration procedure according to 5.3.5.3;

1> else if *RRCRelease* is included within *dl-DCCH-MessageNR*:

2> perform the RRC release procedure according to 5.3.8;

1> else if E-UTRA *RRCConnectionReconfiguration* is included within *dl-DCCH-MessageEUTRA*:

2> perform the RRC connection reconfiguration procedure as specified in TS 36.331 [10], clause 5.3.5.3;

1> else if E-UTRA *RRCConnectionRelease* is included within *dl-DCCH-MessageEUTRA*:

2> perform the RRC connection release as specified in TS 36.331 [10], clause 5.3.8;

END OF CHANGES

START OF CHANGES

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

## 6.2 RRC messages

### 6.2.1 General message structure

#### *– DL-DCCH-Message*

The *DL-DCCH-Message* class is the set of RRC messages that may be sent from the network to the UE on the downlink DCCH logical channel.

-- ASN1START

-- TAG-DL-DCCH-MESSAGE-START

DL-DCCH-Message ::= SEQUENCE {

 message DL-DCCH-MessageType

}

DL-DCCH-MessageType ::= CHOICE {

 c1 CHOICE {

 rrcReconfiguration RRCReconfiguration,

 rrcResume RRCResume,

 rrcRelease RRCRelease,

 rrcReestablishment RRCReestablishment,

 securityModeCommand SecurityModeCommand,

 dlInformationTransfer DLInformationTransfer,

 ueCapabilityEnquiry UECapabilityEnquiry,

 counterCheck CounterCheck,

 mobilityFromNRCommand MobilityFromNRCommand,

 ueInformationRequest-r16 UEInformationRequest,

 dlInformationTransferMRDC-r16 DLInformationTransferMRDC,

 spare5 NULL, spare4 NULL,

 spare3 NULL, spare2 NULL, spare1 NULL

 },

 messageClassExtension SEQUENCE {}

}

-- TAG-DL-DCCH-MESSAGE-STOP

-- ASN1STOP

END OF CHANGES

START OF CHANGES

#### *– UL-DCCH-Message*

The *UL-DCCH-Message* class is the set of RRC messages that may be sent from the UE to the network on the uplink DCCH logical channel.

-- ASN1START

-- TAG-UL-DCCH-MESSAGE-START

UL-DCCH-Message ::= SEQUENCE {

 message UL-DCCH-MessageType

}

UL-DCCH-MessageType ::= CHOICE {

 c1 CHOICE {

 measurementReport MeasurementReport,

 rrcReconfigurationComplete RRCReconfigurationComplete,

 rrcSetupComplete RRCSetupComplete,

 rrcReestablishmentComplete RRCReestablishmentComplete,

 rrcResumeComplete RRCResumeComplete,

 securityModeComplete SecurityModeComplete,

 securityModeFailure SecurityModeFailure,

 ulInformationTransfer ULInformationTransfer,

 locationMeasurementIndication LocationMeasurementIndication,

 ueCapabilityInformation UECapabilityInformation,

 counterCheckResponse CounterCheckResponse,

 ueAssistanceInformation UEAssistanceInformation,

 failureInformation FailureInformation,

 ulInformationTransferMRDC ULInformationTransferMRDC,

 scgFailureInformation SCGFailureInformation,

 scgFailureInformationEUTRA SCGFailureInformationEUTRA

 },

 messageClassExtension CHOICE{

 c2 CHOICE {

 mcgFailureInformation-r16 MCGFailureInformation,

 ueInformationResponse-r16 UEInformationResponse-r16,

 spare14 NULL, spare13 NULL,

 spare12 NULL, spare11 NULL, spare10 NULL,

 spare9 NULL, spare8 NULL, spare7 NULL,

 spare6 NULL, spare5 NULL, spare4 NULL,

 spare3 NULL, spare2 NULL, spare1 NULL

 }

 },

 messageClassExtensionFuture-r16 SEQUENCE {}

}

-- TAG-UL-DCCH-MESSAGE-STOP

-- ASN1STOP

END OF CHANGES

START OF CHANGES

### 6.2.2 Message definitions

[…]

#### *– DLInformationTransferMRDC*

The *DLInformationTransferMRDC* message is used for the downlink transfer of MR-DC dedicated information (e.g. for transferring NR or E-UTRA RRC connection reconfiguration or RRC connection release messages).

Signalling radio bearer: SRB3

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*DLInformationTransferMRDC message*

-- ASN1START

-- TAG-DLINFORMATIONTRANSFERMRDC-START

DLInformationTransferMRDC-r16 ::= SEQUENCE {

 criticalExtensions CHOICE {

 c1 CHOICE {

 dlInformationTransferMRDC-r16 DLInformationTransferMRDC-r16-IEs,

 spare3 NULL, spare2 NULL, spare1 NULL

 },

 criticalExtensionsFuture SEQUENCE {}

 }

}

DLInformationTransferMRDC-r16-IEs::= SEQUENCE {

 dl-DCCH-MessageNR-r16 OCTET STRING OPTIONAL,

 dl-DCCH-MessageENRUTRA-r16 OCTET STRING OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-DLINFORMATIONTRANSFERMRDC-STOP

-- ASN1STOP

| *DLInformationTransferMRDC* field descriptions |
| --- |
| ***dl-DCCH-MessageNR***Includes the *DL-DCCH-Message*. In this version of the specification, the field is only used to transfer the NR *RRCReconfiguration* and *RRCRelease* messages. |
| ***dl-DCCH-MessageEUTRA***Includes the *DL-DCCH-Message*. In this version of the specification, the field is only used to transfer the E-UTRA RRC *RRCConnectionReconfiguration* and *RRCConnectionRelease* messages as specified in TS 36.331 [10].. |
|  |

[…]

#### *– MCGFailureInformation*

The *MCGFailureInformation* message is used to provide information regarding NR MCG failures detected by the UE.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to Network

*MCGFailureInformation* message

-- ASN1START

-- TAG-MCGFAILUREINFORMATION-START

MCGFailureInformation-r16 ::= SEQUENCE {

 criticalExtensions CHOICE {

 mcgFailureInformation-r16 MCGFailureInformation-r16-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

MCGFailureInformation-r16-IEs ::= SEQUENCE {

 failureReportMCG-r16 FailureReportMCG-r16 OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

FailureReportMCG-r16 ::= SEQUENCE {

 failureType-r16 ENUMERATED {

 t310-Expiry, randomAccessProblem,

 rlc-MaxNumRetx, spare},

 measResultFreqList-r16 MeasResultList2NR, OPTIONAL,

 measResultFreqListEUTRA-r16 MeasResultList2EUTRA OPTIONAL,

 measResultSCG-r16 OCTET-STRING (CONTAINING MeasResultSCG-Failure) OPTIONAL,

 measResultSCG-EUTRA-r16 OCTET-STRING OPTIONAL,

 ...

}

MeasResultList2NR ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2NR

MeasResultList2EUTRA ::= SEQUENCE (SIZE (1..maxNrofServingCellsEUTRA)) OF MeasResult2EUTRA

-- TAG-MCGFAILUREINFORMATION-STOP

-- ASN1STOP

| *MCGFailureInformation field descriptions* |
| --- |
| ***measResultFreqList***The field contains available results of measurements on NR frequencies the UE is configured to measure by the *measConfig* associated with the MCG. |
| ***measResultFreqListEUTRA***The field contains available results of measurements on E-UTRA frequencies the UE is configured to measure by *measConfig* associated with the MCG. |
| ***measResultSCG***The field contains the *MeasResultSCG-Failure* IE which includes available measurement results on NR frequencies the UE is configured to measure by the *measConfig* associated with the SCG. |
| ***measResultSCG-EUTRA***The field contains the EUTRA *MeasResultSCG-FailureMRDC* IE which includes available results of measurements on E-UTRA frequencies the UE is configured to measure by the E-UTRA *RRCConnectionReconfiguration* message as specified in TS 36.331 [10]. |

[…]

#### – *RRCReconfiguration*

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

Signalling radio bearer: SRB1 or SRB3

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*RRCReconfiguration message*

-- ASN1START

-- TAG-RRCRECONFIGURATION-START

RRCReconfiguration ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 rrcReconfiguration RRCReconfiguration-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

RRCReconfiguration-IEs ::= SEQUENCE {

 radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

 secondaryCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

 measConfig MeasConfig OPTIONAL, -- Need M

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension RRCReconfiguration-v1530-IEs OPTIONAL

}

RRCReconfiguration-v1530-IEs ::= SEQUENCE {

 masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

 fullConfig ENUMERATED {true} OPTIONAL, -- Cond FullConfig

 dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message OPTIONAL, -- Cond nonHO

 masterKeyUpdate MasterKeyUpdate OPTIONAL, -- Cond MasterKeyChange

 dedicatedSIB1-Delivery OCTET STRING (CONTAINING SIB1) OPTIONAL, -- Need N

 dedicatedSystemInformationDelivery OCTET STRING (CONTAINING SystemInformation) OPTIONAL, -- Need N

 otherConfig OtherConfig OPTIONAL, -- Need M

 nonCriticalExtension RRCReconfiguration-v1540-IEs OPTIONAL

}

RRCReconfiguration-v1540-IEs ::= SEQUENCE {

 otherConfig-v1540 OtherConfig-v1540 OPTIONAL, -- Need M

 nonCriticalExtension RRCReconfiguration-v1560-IEs OPTIONAL

}

RRCReconfiguration-v1560-IEs ::= SEQUENCE {

 mrdc-SecondaryCellGroupConfig SetupRelease { MRDC-SecondaryCellGroupConfig } OPTIONAL, -- Need M

 radioBearerConfig2 OCTET STRING (CONTAINING RadioBearerConfig) OPTIONAL, -- Need M

 sk-Counter SK-Counter OPTIONAL, -- Need N

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

MRDC-SecondaryCellGroupConfig ::= SEQUENCE {

 mrdc-ReleaseAndAdd ENUMERATED {true} OPTIONAL, -- Need N

 mrdc-SecondaryCellGroup CHOICE {

 nr-SCG OCTET STRING (CONTAINING RRCReconfiguration),

 eutra-SCG OCTET STRING

 }

}

MasterKeyUpdate ::= SEQUENCE {

 keySetChangeIndicator BOOLEAN,

 nextHopChainingCount NextHopChainingCount,

 nas-Container OCTET STRING OPTIONAL, -- Cond securityNASC

 ...

}

-- TAG-RRCRECONFIGURATION-STOP

-- ASN1STOP

|  |
| --- |
| *RRCReconfiguration-IEs* field descriptions |
| ***dedicatedNAS-MessageList***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.  |
| ***dedicatedSIB1-Delivery***This field is used to transfer *SIB1* to the UE. The field has the same values as the corresponding configuration in *servingCellConfigCommon*. |
| ***dedicatedSystemInformationDelivery***This field is used to transfer *SIB6*, *SIB7*, *SIB8* to the UE. |
| ***fullConfig***Indicates that the full configuration option is applicable for the *RRCReconfiguration* message for intra-system intra-RAT HO. For inter-RAT HO from E-UTRA to NR, *fullConfig* indicates whether or not delta signalling of SDAP/PDCP from source RAT is applicable. |
| ***keySetChangeIndicator***Indicates whether UE shall derive a new KgNB. If *reconfigurationWithSync* is included, value *true* indicates that a KgNB key is derived from a KAMF key taken into use through the latest successful NAS SMC procedure, or N2 handover procedure with KAMF change, as described in TS 33.501 [11] for KgNB re-keying. Value *false* indicates that the new KgNB key is obtained from the current KgNB key or from the NH as described in TS 33.501 [11]. |
| ***masterCellGroup***Configuration of master cell group. |
| ***mrdc-ReleaseAndAdd***This field indicates that the current SCG configuration is released and a new SCG is added at the same time. |
| ***mrdc-SecondaryCellGroup***Includes an RRC message for SCG configuration in NR-DC or NE-DC.For NR-DC (nr-SCG), *mrdc-SecondaryCellGroup* contains the *RRCReconfiguration* message as generated (entirely) by SN gNB. In this version of the specification, the RRC message can only include fields *secondaryCellGroup* and *measConfig*.For NE-DC (eutra-SCG), *mrdc-SecondaryCellGroup* includes the E-UTRA *RRCConnectionReconfiguration* message as specified in TS 36.331 [10]. In this version of the specification, the E-UTRA RRC message can only include the field *scg-Configuration*. |
| ***nas-Container***This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although it affects activation of AS security after inter-system handover to NR. The content is defined in TS 24.501 [23]. |
| ***nextHopChainingCount***Parameter NCC: See TS 33.501 [11] |
| ***otherConfig***Contains configuration related to other configurations. |
| ***radioBearerConfig***Configuration of Radio Bearers (DRBs, SRBs) including SDAP/PDCP. In EN-DC this field may only be present if the *RRCReconfiguration* is transmitted over SRB3. |
| ***radioBearerConfig2***Configuration of Radio Bearers (DRBs, SRBs) including SDAP/PDCP. This field can only be used if the UE supports NR-DC or NE-DC. |
| ***secondaryCellGroup***Configuration of secondary cell group ((NG)EN-DC or NR-DC). This field is absent when the *RRCReconfiguration* message is directly transmitted via MCG SRB1 and not within *mrdc-secondaryCellGroup*. |
| ***sk-Counter***A counter used upon initial configuration of S-KgNB or S-KeNB, as well as upon refresh of S-KgNB or S-KeNB. This field is always included upon initial configuration of an NR SCG or upon configuration of the first RB with *keyToUse* set to *secondary*. This field is absent if there is neither any NR SCG nor any RB with *keyToUse* set to *secondary*. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *nonHO* | The field is absent in case of reconfiguration with sync within NR or to NR; otherwise it is optionally present, need N. |
| *securityNASC* | This field is mandatory present in case of inter system handover. Otherwise the field is optionally present, need N. |
| *MasterKeyChange* | This field is mandatory present in case *masterCellGroup* includes *ReconfigurationWithSync* and *RadioBearerConfig* includes *SecurityConfig* with *SecurityAlgorithmConfig*, indicating a change of the AS security algorithms associated to the master key. If *ReconfigurationWithSync* is included for other cases, this field is optionally present, need N. Otherwise the field is absent. |
| *FullConfig* | The field is mandatory present in case of inter-system handover from E-UTRA/EPC to NR. It is optionally present, Need N, during reconfiguration with sync and also in first reconfiguration after reestablishment; or for intra-system handover from E-UTRA/5GC to NR. It is absent otherwise. |

[…]

#### – *RRCRelease*

The *RRCRelease* message is used to command the release of an RRC connection or the suspension of the RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*RRCRelease* message

-- ASN1START

-- TAG-RRCRELEASE-START

RRCRelease ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 rrcRelease RRCRelease-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

RRCRelease-IEs ::= SEQUENCE {

 redirectedCarrierInfo RedirectedCarrierInfo OPTIONAL, -- Need N

 cellReselectionPriorities CellReselectionPriorities OPTIONAL, -- Need R

 suspendConfig SuspendConfig OPTIONAL, -- Need R

 deprioritisationReq SEQUENCE {

 deprioritisationType ENUMERATED {frequency, nr},

 deprioritisationTimer ENUMERATED {min5, min10, min15, min30}

 } OPTIONAL, -- Need N

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension RRCRelease-v1540-IEs OPTIONAL

}

RRCRelease-v1540-IEs ::= SEQUENCE {

 waitTime RejectWaitTime OPTIONAL, -- Need N

 nonCriticalExtension RRCRelease-v16xx-IEs OPTIONAL

}

RRCRelease-v16xx-IEs ::= SEQUENCE {

 measIdleConfig-r16 MeasIdleConfigDedicated-r16 OPTIONAL, -- Need FFS

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

RedirectedCarrierInfo ::= CHOICE {

 nr CarrierInfoNR,

 eutra RedirectedCarrierInfo-EUTRA,

 ...

}

RedirectedCarrierInfo-EUTRA ::= SEQUENCE {

 eutraFrequency ARFCN-ValueEUTRA,

 cnType ENUMERATED {epc,fiveGC} OPTIONAL -- Need N

}

CarrierInfoNR ::= SEQUENCE {

 carrierFreq ARFCN-ValueNR,

 ssbSubcarrierSpacing SubcarrierSpacing,

 smtc SSB-MTC OPTIONAL, -- Need S

 ...

}

SuspendConfig ::= SEQUENCE {

 fullI-RNTI I-RNTI-Value,

 shortI-RNTI ShortI-RNTI-Value,

 ran-PagingCycle PagingCycle,

 ran-NotificationAreaInfo RAN-NotificationAreaInfo OPTIONAL, -- Need M

 t380 PeriodicRNAU-TimerValue OPTIONAL, -- Need R

 nextHopChainingCount NextHopChainingCount,

 ...

}

PeriodicRNAU-TimerValue ::= ENUMERATED { min5, min10, min20, min30, min60, min120, min360, min720}

CellReselectionPriorities ::= SEQUENCE {

 freqPriorityListEUTRA FreqPriorityListEUTRA OPTIONAL, -- Need M

 freqPriorityListNR FreqPriorityListNR OPTIONAL, -- Need M

 t320 ENUMERATED {min5, min10, min20, min30, min60, min120, min180, spare1} OPTIONAL, -- Need R

 ...

}

PagingCycle ::= ENUMERATED {rf32, rf64, rf128, rf256}

FreqPriorityListEUTRA ::= SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA

FreqPriorityListNR ::= SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityNR

FreqPriorityEUTRA ::= SEQUENCE {

 carrierFreq ARFCN-ValueEUTRA,

 cellReselectionPriority CellReselectionPriority,

 cellReselectionSubPriority CellReselectionSubPriority OPTIONAL -- Need R

}

FreqPriorityNR ::= SEQUENCE {

 carrierFreq ARFCN-ValueNR,

 cellReselectionPriority CellReselectionPriority,

 cellReselectionSubPriority CellReselectionSubPriority OPTIONAL -- Need R

}

RAN-NotificationAreaInfo ::= CHOICE {

 cellList PLMN-RAN-AreaCellList,

 ran-AreaConfigList PLMN-RAN-AreaConfigList,

 ...

}

PLMN-RAN-AreaCellList ::= SEQUENCE (SIZE (1.. maxPLMNIdentities)) OF PLMN-RAN-AreaCell

PLMN-RAN-AreaCell ::= SEQUENCE {

 plmn-Identity PLMN-Identity OPTIONAL, -- Need S

 ran-AreaCells SEQUENCE (SIZE (1..32)) OF CellIdentity

}

PLMN-RAN-AreaConfigList ::= SEQUENCE (SIZE (1..maxPLMNIdentities)) OF PLMN-RAN-AreaConfig

PLMN-RAN-AreaConfig ::= SEQUENCE {

 plmn-Identity PLMN-Identity OPTIONAL, -- Need S

 ran-Area SEQUENCE (SIZE (1..16)) OF RAN-AreaConfig

}

RAN-AreaConfig ::= SEQUENCE {

 trackingAreaCode TrackingAreaCode,

 ran-AreaCodeList SEQUENCE (SIZE (1..32)) OF RAN-AreaCode OPTIONAL -- Need R

}

-- TAG-RRCRELEASE-STOP

-- ASN1STOP

|  |
| --- |
| *RRCRelease-IEs* field descriptions |
| ***cnType***Indicate that the UE is redirected to EPC or 5GC. |
| ***deprioritisationReq***Indicates whether the current frequency or RAT is to be de-prioritised. |
| ***deprioritisationTimer***Indicates the period for which either the current carrier frequency or NR is deprioritised. Value *minN* corresponds to N minutes. |
| ***measIdleConfig***Indicates measurement configuration to be stored and used by the UE while in RRC\_IDLE or RRC\_INACTIVE. |
| ***suspendConfig***Indicates configuration for the RRC\_INACTIVE state. The network does not configure *suspendConfig* when the network redirect the UE to an inter-RAT carrier frequency. |
| ***redirectedCarrierInfo***Indicates a carrier frequency (downlink for FDD) and is used to redirect the UE to an NR or an inter-RAT carrier frequency, by means of cell selection at transition to RRC\_IDLE or RRC\_INACTIVE as specified in TS 38.304 [20] |

|  |
| --- |
| *CarrierInfoNR* field descriptions |
| ***carrierFreq***Indicates the redirected NR frequency. |
| ***ssbSubcarrierSpacing***Subcarrier spacing of SSB in the redirected SSB frequency. Only the values 15 kHz or 30 kHz (FR1), and 120 kHz or 240 kHz (FR2) are applicable. |
| ***smtc***The SSB periodicity/offset/duration configuration for the redirected SSB frequency. It is based on timing reference of PCell. If the field is absent, the UE uses the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. |

|  |
| --- |
| *RAN-NotificationAreaInfo* field descriptions |
| ***cellList***A list of cells configured as RAN area. |
| ***ran-AreaConfigList***A list of RAN area codes or RA code(s) as RAN area. |

|  |
| --- |
| *PLMN-RAN-AreaConfig* field descriptions |
| ***plmn-Identity***PLMN Identity to which the cells in *ran-Area* belong. If the field is absent the UE uses the ID of the registered PLMN. |
| ***ran-AreaCodeList***The total number of RAN-AreaCodes of all PLMNs does not exceed 32. |
| ***ran-Area***Indicates whether TA code(s) or RAN area code(s) are used for the RAN notification area. The network uses only TA code(s) or RAN area code(s) to configure a UE. The total number of TACs across all PLMNs does not exceed 16. |

|  |
| --- |
| *PLMN-RAN-AreaCell* field descriptions |
| ***plmn-Identity***PLMN Identity to which the cells in *ran-AreaCells* belong. If the field is absent the UE uses the ID of the registered PLMN. |
| ***ran-AreaCells***The total number of cells of all PLMNs does not exceed 32. |

|  |
| --- |
| *SuspendConfig* field descriptions |
| ***ran-NotificationAreaInfo***Network ensures that the UE in RRC\_INACTIVE always has a valid *ran-NotificationAreaInfo*. |
| ***ran-PagingCycle***Refers to the UE specific cycle for RAN-initiated paging. Value *rf32* corresponds to 32 radio frames, value *rf64* corresponds to 64 radio frames and so on. |
| ***t380***Refers to the timer that triggers the periodic RNAU procedure in UE. Value *min5* corresponds to 5 minutes, value *min10* corresponds to 10 minutes and so on. |

 […]

#### – *RRCResume*

The *RRCResume* message is used to resume the suspended RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*RRCResume* message

-- ASN1START

-- TAG-RRCRESUME-START

RRCResume ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 rrcResume RRCResume-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

RRCResume-IEs ::= SEQUENCE {

 radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

 masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

 measConfig MeasConfig OPTIONAL, -- Need M

 fullConfig ENUMERATED {true} OPTIONAL, -- Need N

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension RRCResume-v1560-IEs OPTIONAL

}

RRCResume-v1560-IEs ::= SEQUENCE {

 radioBearerConfig2 OCTET STRING (CONTAINING RadioBearerConfig) OPTIONAL, -- Need M

 sk-Counter SK-Counter OPTIONAL,

 nonCriticalExtension RRCResume-v16xx-IEs OPTIONAL

}

RRCResume-v16xx-IEs ::= SEQUENCE {

 idleModeMeasurementReq-r16 FFS-Value OPTIONAL, -- Need N

 restoreMCG-SCells-r16 ENUMERATED {true} OPTIONAL, -- Need N

 restoreSCG-r16 ENUMERATED {true} OPTIONAL, -- Need N

 mrdc-SecondaryCellGroup-r16 CHOICE {

 nr-SCG-r16 OCTET STRING,

 eutra-SCG-r16 OCTET STRING

 } OPTIONAL, -- Need M

 nonCriticalExtension SEQUENCE{} OPTIONAL

}

-- TAG-RRCRESUME-STOP

-- ASN1STOP

|  |
| --- |
| *RRCResume-IEs* field descriptions |
| ***idleModeMeasurementReq*** This field indicates that the UE shall report the idle mode measurements to the network in the *RRCResumeComplete* message |
| ***masterCellGroup***Configuration of the master cell group: |
| ***mrdc-SecondaryCellGroup***Includes an RRC message for SCG configuration in NR-DC or NE-DC. For NR-DC (*nr-SCG*), *mrdc-SecondaryCellGroup* contains the *RRCReconfiguration* message as generated (entirely) by SN gNB. In this version of the specification, the RRC message only includes fields *secondaryCellGroup* and *measConfig*. For NE-DC (*eutra-SCG*), *mrdc-SecondaryCellGroup* includes the E-UTRA *RRCConnectionReconfiguration* message as specified in TS 36.331 [10]. In this version of the specification, the E-UTRA RRC message only includes fields *SCG-Configuration* (with no PDCP configuration present) and/or *mobilityControlInfoSCG* and/ or *measConfigSN*. |
| ***radioBearerConfig***Configuration of Radio Bearers (DRBs, SRBs) including SDAP/PDCP. |
| ***radioBearerConfig2***Configuration of Radio Bearers (DRBs, SRBs) including SDAP/PDCP. This field can only be used if the UE supports NR-DC or NE-DC. |
| ***restoreMCG-SCells***Indicates that the UE shall restore the MCG SCells from the UE Inactive AS Context, if stored. |
| ***restoreSCG***Indicates that the UE shall not release the SCG configurations, if configured. |
| ***sk-Counter***A counter used to derive S-KgNB or S-KeNB based on the newly derived KgNB during RRC Resume. The field is only included with there is one or more RB with *keyToUse* set to *secondary*.  |

[…]

#### – *RRCResumeComplete*

The *RRCResumeComplete* 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 Network

*RRCResumeComplete* message

-- ASN1START

-- TAG-RRCRESUMECOMPLETE-START

RRCResumeComplete ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 rrcResumeComplete RRCResumeComplete-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

RRCResumeComplete-IEs ::= SEQUENCE {

 dedicatedNAS-Message DedicatedNAS-Message OPTIONAL,

 selectedPLMN-Identity INTEGER (1..maxPLMN) OPTIONAL,

 uplinkTxDirectCurrentList UplinkTxDirectCurrentList OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension RRCResumeComplete-v16xx OPTIONAL

}

RRCResumeComplete-v16xx-IEs ::= SEQUENCE {

 idleMeasAvailable-r16 ENUMERATED {true} OPTIONAL,

 measResultListIdle-r16 MeasResultListIdle-r16 OPTIONAL,

 nonCriticalExtension SEQUENCE{} OPTIONAL

}

-- TAG-RRCRESUMECOMPLETE-STOP

-- ASN1STOP

|  |
| --- |
| *RRCResumeComplete-IEs* field descriptions |
| ***idleMeasAvailable***Indication that the UE has idle mode measurement report available. |
| ***measResultListIdle***This field indicates the measurement results done during IDLE or INACTIVE mode at network request. |
| ***selectedPLMN-Identity***Index of the PLMN selected by the UE from the *plmn-IdentityList* fields included in *SIB1*. |
| ***uplinkTxDirectCurrentList***The Tx Direct Current locations for the configured serving cells and BWPs if requested by the NW (see *reportUplinkTxDirectCurrent* in *CellGroupConfig*). |

[…]

#### – *RRCSetupComplete*

The *RRCSetupComplete* message is used to confirm the successful completion of an RRC connection establishment.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to Network

*RRCSetupComplete* message

-- ASN1START

-- TAG-RRCSETUPCOMPLETE-START

RRCSetupComplete ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 rrcSetupComplete RRCSetupComplete-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

RRCSetupComplete-IEs ::= SEQUENCE {

 selectedPLMN-Identity INTEGER (1..maxPLMN),

 registeredAMF RegisteredAMF OPTIONAL,

 guami-Type ENUMERATED {native, mapped} OPTIONAL,

 s-NSSAI-List SEQUENCE (SIZE (1..maxNrofS-NSSAI)) OF S-NSSAI OPTIONAL,

 dedicatedNAS-Message DedicatedNAS-Message,

 ng-5G-S-TMSI-Value CHOICE {

 ng-5G-S-TMSI NG-5G-S-TMSI,

 ng-5G-S-TMSI-Part2 BIT STRING (SIZE (9))

 } OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension RRCSetupComplete-v16xx-IEs OPTIONAL

}

RRCSetupComplete-v16xx-IEs ::= SEQUENCE {

 idleMeasAvailable-r16 ENUMERATED {true} OPTIONAL,

 nonCriticalExtension SEQUENCE{} OPTIONAL

}

RegisteredAMF ::= SEQUENCE {

 plmn-Identity PLMN-Identity OPTIONAL,

 amf-Identifier AMF-Identifier

}

-- TAG-RRCSETUPCOMPLETE-STOP

-- ASN1STOP

|  |
| --- |
| *RRCSetupComplete-IEs* field descriptions |
| ***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 [23]. |
| ***idleMeasAvailable***Indication that the UE has idle/inactive measurement report available. |
| ***ng-5G-S-TMSI-Part2***The leftmost 9 bits of 5G-S-TMSI. |
| ***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 [21]. |
| ***selectedPLMN-Identity***Index of the PLMN selected by the UE from the *plmn-IdentityList* fields included in SIB1. |

[…]

#### – *SIB1*

*SIB1* contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information.It also contains radio resource configuration information that is common for all UEs and barring information applied to the unified access control.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channels: BCCH

Direction: Network to UE

*SIB1* message

-- ASN1START

-- TAG-SIB1-START

SIB1 ::= SEQUENCE {

 cellSelectionInfo SEQUENCE {

 q-RxLevMin Q-RxLevMin,

 q-RxLevMinOffset INTEGER (1..8) OPTIONAL, -- Need S

 q-RxLevMinSUL Q-RxLevMin OPTIONAL, -- Need R

 q-QualMin Q-QualMin OPTIONAL, -- Need S

 q-QualMinOffset INTEGER (1..8) OPTIONAL -- Need S

 } OPTIONAL, -- Cond Standalone

 cellAccessRelatedInfo CellAccessRelatedInfo,

 connEstFailureControl ConnEstFailureControl OPTIONAL, -- Need R

 si-SchedulingInfo SI-SchedulingInfo OPTIONAL, -- Need R

 servingCellConfigCommon ServingCellConfigCommonSIB OPTIONAL, -- Need R

 ims-EmergencySupport ENUMERATED {true} OPTIONAL, -- Need R

 eCallOverIMS-Support ENUMERATED {true} OPTIONAL, -- Cond Absent

 ue-TimersAndConstants UE-TimersAndConstants OPTIONAL, -- Need R

 uac-BarringInfo SEQUENCE {

 uac-BarringForCommon UAC-BarringPerCatList OPTIONAL, -- Need S

 uac-BarringPerPLMN-List UAC-BarringPerPLMN-List OPTIONAL, -- Need S

 uac-BarringInfoSetList UAC-BarringInfoSetList,

 uac-AccessCategory1-SelectionAssistanceInfo CHOICE {

 plmnCommon UAC-AccessCategory1-SelectionAssistanceInfo,

 individualPLMNList SEQUENCE (SIZE (2..maxPLMN)) OF UAC-AccessCategory1-SelectionAssistanceInfo

 } OPTIONAL -- Need S

 } OPTIONAL, -- Need R

 useFullResumeID ENUMERATED {true} OPTIONAL, -- Need N

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SIB1-v16xx-IEs OPTIONAL

}

UAC-AccessCategory1-SelectionAssistanceInfo ::= ENUMERATED {a, b, c}

SIB1-v16xx-IEs ::= SEQUENCE {

 idleModeMeasurements-r16 FFS OPTIONAL, -- Need FFS

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-SIB1-STOP

-- ASN1STOP

|  |
| --- |
| *SIB1* field descriptions |
| ***cellSelectionInfo***Parameters for cell selection related to the serving cell. |
| ***idleModeMeasurements***This field indicates that the UE can include idle/inactive measurement report availability during connection establishment or resumption.  |
| ***ims-EmergencySupport***Indicates whether the cell supports IMS emergency bearer services for UEs in limited service mode. If absent, IMS emergency call is not supported by the network in the cell for UEs in limited service mode. |
| ***q-QualMin***Parameter "Qqualmin" in TS 38.304 [20], applicable for serving cell. If the field is absent, the UE applies the (default) value of negative infinity for Qqualmin.  |
| ***q-QualMinOffset***Parameter "Qqualminoffset" in TS 38.304 [20]. Actual value Qqualminoffset = field value [dB]. If the field is absent, the UE applies the (default) value of 0 dB for Qqualminoffset.Affects the minimum required quality level in the cell. |
| ***q-RxLevMin***Parameter "Qrxlevmin" in TS 38.304 [20], applicable for serving cell. |
| ***q-RxLevMinOffset***Parameter "Qrxlevminoffset" in TS 38.304 [20]. Actual value Qrxlevminoffset = field value \* 2 [dB]. If absent, the UE applies the (default) value of 0 dB for Qrxlevminoffset*.* Affects the minimum required Rx level in the cell. |
| ***q-RxLevMinSUL***Parameter "Qrxlevmin" in TS 38.304 [20], applicable for serving cell. |
| ***servingCellConfigCommon***Configuration of the serving cell. |
| ***uac-AccessCategory1-SelectionAssistanceInfo***Information used to determine whether Access Category 1 applies to the UE, as defined in TS 22.261 [25]. |
| ***uac-BarringForCommon***Common access control parameters for each access category. Common values are used for all PLMNs, unless overwritten by the PLMN specific configuration provided in *uac-BarringPerPLMN-List*. The parameters are specified by providing an index to the set of configurations (*uac-BarringInfoSetList*). UE behaviour upon absence of this field is specified in clause 5.3.14.2. |
| ***ue-TimersAndConstants***Timer and constant values to be used by the UE. |
| ***useFullResumeID***Indicates which resume identifier and Resume request message should be used. UE uses *fullI-RNTI* and *RRCResumeRequest1* if the field is present, or *shortI-RNTI* and *RRCResumeRequest* if the field is absent. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *Absent* | The field is not used in this version of the specification, if received the UE shall ignore. |
| *Standalone* | The field is mandatory present in a cell that supports standalone operation, otherwise it is absent. |

[…]

#### – *UEInformationRequest*

The *UEInformationRequeste* message is used by the network to retrieve information from the UE.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*UEInformationResponse message*

-- ASN1START

-- TAG-UEINFORMATIONREQUEST-START

UEInformationRequest ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 ueInformationRequest UEInformationRequest-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

UEInformationRequest-IEs ::= SEQUENCE {

 idleModeMeasurementReq FFS-Value OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-UEINFORMATIONREQUEST-STOP

-- ASN1STOP

|  |
| --- |
| *UEInformationRequest-IEs* field descriptions |
| ***idleModeMeasurementReq*** This field indicates that the UE shall report the idle/inactive measurement information, if available, to the network in the *UEInformationResponse* message  |

 […]

#### – *UEInformationResponse*

The *UEInformationResponse* message is used by the UE to transfer information requested by the network.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to network

*UEInformationResponse message*

-- ASN1START

-- TAG-UEINFORMATIONRESPONSE-START

UEInformationRepsonse ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 ueInformationResponse UEInformationResponse-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

UEInformationResponse-IEs ::= SEQUENCE {

 measResultListIdle MeasResultListIdle-r16 OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-UEINFORMATIONRESPONSE-STOP

-- ASN1STOP

|  |
| --- |
| *UEInformationResponse-IEs* field descriptions |
| ***measResultListIdle***This field indicates the measurement results done during IDLE or INACTIVE mode at network request. |

[…]

#### *– ULInformationTransferMRDC*

The *ULInformationTransferMRDC* message is used for the uplink transfer of MR-DC dedicated information (e.g. for transferring the NR or E-UTRA RRC *MeasurementReport* message, the *FailureInformation* message, or the *MCGFailureInformation* message).

Signalling radio bearer: SRB1, SRB3

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to Network

*ULInformationTransferMRDC message*

-- ASN1START

-- TAG-ULINFORMATIONTRANSFERMRDC-START

ULInformationTransferMRDC ::= SEQUENCE {

 criticalExtensions CHOICE {

 c1 CHOICE {

 ulInformationTransferMRDC ULInformationTransferMRDC-IEs,

 spare3 NULL, spare2 NULL, spare1 NULL

 },

 criticalExtensionsFuture SEQUENCE {}

 }

}

ULInformationTransferMRDC-IEs::= SEQUENCE {

 ul-DCCH-MessageNR OCTET STRING OPTIONAL,

 ul-DCCH-MessageEUTRA OCTET STRING OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-ULINFORMATIONTRANSFERMRDC-STOP

-- ASN1STOP

| *ULInformationTransferMRDC* field descriptions |
| --- |
| ***ul-DCCH-MessageNR***Includes the *UL-DCCH-Message*. In this version of the specification, the field is only used to transfer the NR RRC *MeasurementReport* and *FailureInformation* messages when sent via SRB1 and to transfer the NR *MCGFailureInformation* message when sent via SRB3. |
| ***ul-DCCH-MessageEUTRA***Includes the *UL-DCCH-Message*. In this version of the specification, the field is only used to transfer the E-UTRA RRC *MeasurementReport* and *FailureInformation* messages when sent via SRB1 and to transfer the E-UTRA *MCGFailureInformation* message when sent via SRB3. |

END OF CHANGES

START OF CHANGES

### 6.3.1 System information blocks

[…]

#### – *SIBx*

*SIBx* contains information related to idle mode measurements.

*SIBx* information element

-- ASN1START

-- TAG-SIBx-START

SIBx ::= SEQUENCE {

 measIdleConfigSIB-r16 MeasIdleConfigSIB-r16 OPTIONAL, -- Need FFS

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 ...

}

-- TAG-SIBx-STOP

-- ASN1STOP

END OF CHANGES

START OF CHANGES

### 6.3.2 Radio resource control information elements

[…]

#### – *CellGroupConfig*

The *CellGroupConfig* IE is used to configure a master cell group (MCG) or secondary cell group (SCG). A cell group comprises of one MAC entity, a set of logical channels with associated RLC entities and of a primary cell (SpCell) and one or more secondary cells (SCells).

*CellGroupConfig* information element

-- ASN1START

-- TAG-CELLGROUPCONFIG-START

-- Configuration of one Cell-Group:

CellGroupConfig ::= SEQUENCE {

 cellGroupId CellGroupId,

 rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLC-ID)) OF RLC-BearerConfig OPTIONAL, -- Need N

 rlc-BearerToReleaseList SEQUENCE (SIZE(1..maxLC-ID)) OF LogicalChannelIdentity OPTIONAL, -- Need N

 mac-CellGroupConfig MAC-CellGroupConfig OPTIONAL, -- Need M

 physicalCellGroupConfig PhysicalCellGroupConfig OPTIONAL, -- Need M

 spCellConfig SpCellConfig OPTIONAL, -- Need M

 sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig OPTIONAL, -- Need N

 sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellIndex OPTIONAL, -- Need N

 ...,

 [[

 reportUplinkTxDirectCurrent-v1530 ENUMERATED {true} OPTIONAL -- Cond BWP-Reconfig

 ]]

}

-- Serving cell specific MAC and PHY parameters for a SpCell:

SpCellConfig ::= SEQUENCE {

 servCellIndex ServCellIndex OPTIONAL, -- Cond SCG

 reconfigurationWithSync ReconfigurationWithSync OPTIONAL, -- Cond ReconfWithSync

 rlf-TimersAndConstants SetupRelease { RLF-TimersAndConstants } OPTIONAL, -- Need M

 rlmInSyncOutOfSyncThreshold ENUMERATED {n1} OPTIONAL, -- Need S

 spCellConfigDedicated ServingCellConfig OPTIONAL, -- Need M

 ...

}

ReconfigurationWithSync ::= SEQUENCE {

 spCellConfigCommon ServingCellConfigCommon OPTIONAL, -- Need M

 newUE-Identity RNTI-Value,

 t304 ENUMERATED {ms50, ms100, ms150, ms200, ms500, ms1000, ms2000, ms10000},

 rach-ConfigDedicated CHOICE {

 uplink RACH-ConfigDedicated,

 supplementaryUplink RACH-ConfigDedicated

 } OPTIONAL, -- Need N

 ...,

 [[

 smtc SSB-MTC OPTIONAL -- Need S

 ]]

}

SCellConfig ::= SEQUENCE {

 sCellIndex SCellIndex,

 sCellConfigCommon ServingCellConfigCommon OPTIONAL, -- Cond SCellAdd

 sCellConfigDedicated ServingCellConfig OPTIONAL, -- Cond SCellAddMod

 ...,

 [[

 smtc SSB-MTC OPTIONAL -- Need S

 ]],

 [[

 sCellState-r16 ENUMERATED {activated} OPTIONAL -- Need S

 ]]

}

-- TAG-CELLGROUPCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *CellGroupConfig* field descriptions |
| ***mac-CellGroupConfig***MAC parameters applicable for the entire cell group. |
| ***rlc-BearerToAddModList***Configuration of the MAC Logical Channel, the corresponding RLC entities and association with radio bearers. |
| ***reportUplinkTxDirectCurrent***Enables reporting of uplink Direct Current location information upon BWP configuration and reconfiguration. This field is only present when the BWP configuration is modified or any serving cell is added or removed. This field is not present in the IE *CellGroupConfig* when provided as part of *RRCSetup* message. |
| ***rlmInSyncOutOfSyncThreshold***BLER threshold pair index for IS/OOS indication generation, see TS 38.133 [14], Table 8.1.1-1. *n1* corresponds to the value 1. When the field is absent, the UE applies the value 0. Whenever this is reconfigured, UE resets N310 and N311, and stops T310, if running.  |
| ***sCellState***A one-shot field that indicates whether the SCell shall be considered to be in activated state upon SCell configuration. |
| ***sCellToAddModList***List of seconary serving cells (SCells) to be added or modified. |
| ***sCellToReleaseList***List of secondary serving cells (SCells) to be released. |
| ***spCellConfig***Parameters for the SpCell of this cell group (PCell of MCG or PSCell of SCG).  |

|  |
| --- |
| *ReconfigurationWithSync* field descriptions |
| ***rach-ConfigDedicated***Random access configuration to be used for the reconfiguration with sync (e.g. handover). The UE performs the RA according to these parameters in the *firstActiveUplinkBWP* (see *UplinkConfig*). |
| ***smtc***The SSB periodicity/offset/duration configuration of target cell for NR PSCell change and NR PCell change. The network sets the *periodicityAndOffset* to indicate the same periodicity as *ssb-periodicityServingCell* in *spCellConfigCommon*. For case of NR PCell change, the *smtc* is based on the timing reference of source PCell. For case of NR PSCell change, it is based on the timing reference of source PSCell. If the field is absent, the UE uses the SMTC in the *measObjectNR* having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. |

|  |
| --- |
| *SCellConfig* field descriptions |
| ***smtc***The SSB periodicity/offset/duration configuration of target cell for NR SCell addition. The network sets the *periodicityAndOffset* to indicate the same periodicity as *ssb-periodicityServingCell* in *sCellConfigCommon*. The *smtc* is based on the timing of the SpCell of associated cell group. In case of inter-RAT handover to NR, the timing reference is the NR PCell. In case of intra-NR PCell change (standalone NR) or NR PSCell change (EN-DC), the timing reference is the target SpCell. If the field is absent, the UE uses the SMTC in the *measObjectNR* having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. |

|  |
| --- |
| *SpCellConfig* field descriptions |
| ***reconfigurationWithSync***Parameters for the synchronous reconfiguration to the target SpCell. |
| ***rlf-TimersAndConstants***Timers and constants for detecting and triggering cell-level radio link failure. For the SCG, *rlf-TimersAndConstants* can only be set to *setup* and is always included at SCG addition. |
| ***servCellIndex***Serving cell ID of a PSCell. The PCell of the Master Cell Group uses ID = 0. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *BWP-Reconfig* | The field is optionally present, Need N, if the BWPs are reconfigured or if serving cells are added or removed. Otherwise it is absent.  |
| *ReconfWithSync* | The field is mandatory present in case of SpCell change, PSCell addition, update of required SI for PSCell and AS security key change; otherwise it is optionally present, need M. The field is absent in the *masterCellGroup* in *RRCResume* or *RRCSetup* messages. |
| *SCellAdd* | The field is mandatory present upon SCell addition; otherwise it is absent, Need M. |
| *SCellAddMod* | The field is mandatory present upon SCell addition; otherwise it is optionally present, need M. |
| *SCG* | The field is mandatory present in an *SpCellConfig* for the PSCell. It is absent otherwise.  |

[…]

#### – *MeasIdleConfig*

The IE *MeasIdleConfig* is used to convey information to UE about measurements requested to be done while in RRC\_IDLE or RRC\_INACTIVE.

*MeasIdleConfig* information element

-- ASN1START

-- TAG-MEASIDLECONFIG-START

MeasIdleConfigSIB-r16 ::= SEQUENCE {

 measIdleCarrierListNR-r16 NR-CarrierList-r16 OPTIONAL, -- Need FFS

 measIdleCarrierListEUTRA-r16 EUTRA-CarrierList-r16 OPTIONAL, -- Need FFS

 ...

}

MeasIdleConfigDedicated-r16 ::= SEQUENCE {

 measIdleCarrierListNR-r16 NR-CarrierList-r16 OPTIONAL, -- Need FFS

 measIdleCarrierListEUTRA-r16 EUTRA-CarrierList-r16 OPTIONAL, -- Need FFS

 measIdleDuration-r16 FFS-Value,

 ...

}

NR-CarrierList-r16 ::= SEQUENCE (SIZE (1..maxFreqIdle-r16)) OF MeasIdleCarrierNR-r16

EUTRA-CarrierList-r16 ::= SEQUENCE (SIZE (1..maxFreqIdle-r16)) OF MeasIdleCarrierEUTRA-r16

MeasIdleCarrierNR-r16 ::= SEQUENCE {

 carrierFreqNR-r16 ARFCN-ValueNR,

 measCellListNR-r16 CellListNR-r16 OPTIONAL, -- Need FFS

 reportQuantities-r16 ENUMERATED {rsrp, rsrq, both},

 qualityThreshold-r16 SEQUENCE {

 idleRSRP-Threshold-NR-r16 RSRP-Range OPTIONAL, -- Need FFS

 idleRSRQ-Threshold-NR-r16 RSRQ-Range OPTIONAL -- Need FFS

 } OPTIONAL, -- Need FFS

 ssbMeasConfig-r16 SEQUENCE {

 frequencyBandList                   MultiFrequencyBandListNR OPTIONAL,

nrofSS-BlocksToAverage-r16 INTEGER (2..maxNrofSS-BlocksToAverage) OPTIONAL, -- Need FFS

 absThreshSS-BlocksConsolidation-r16 ThresholdNR OPTIONAL, -- Need FFS

 smtc-r16 SSB-MTC OPTIONAL, -- Need FFS

 ssbSubcarrierSpacing-r16 SubcarrierSpacing,

 ssb-ToMeasure-r16 SSB-ToMeasure OPTIONAL, -- Need FFS

 deriveSSB-IndexFromCell-r16 BOOLEAN,

 ss-RSSI-Measurement-r16 SS-RSSI-Measurement OPTIONAL

 } OPTIONAL, -- Cond FFS

 beamMeasConfigIdle-r16 BeamMeasConfigIdle-NR-r16 OPTIONAL, -- Need FFS

 ...

}

MeasIdleCarrierEUTRA-r16 ::= SEQUENCE {

 carrierFreqEUTRA-r16 ARFCN-ValueEUTRA,

 allowedMeasBandwidth-r16 EUTRA-AllowedMeasBandwidth,

 measCellListEUTRA-r16 CellListEUTRA-r16 OPTIONAL, -- Need FFS

 reportQuantities-r16 ENUMERATED {rsrp, rsrq, both},

 qualityThreshold-r16 SEQUENCE {

 idleRSRP-Threshold-EUTRA-r16 RSRP-RangeEUTRA OPTIONAL, -- Need FFS

 idleRSRQ-Threshold-EUTRA-r16 RSRQ-RangeEUTRA-r16 OPTIONAL -- Need FFS

 } OPTIONAL, -- Need FFS

 ...

}

CellListNR-r16 ::= SEQUENCE (SIZE (1..maxCellMeasIdle-r16)) OF PhysCellId

CellListEUTRA-r16 ::= SEQUENCE (SIZE (1..maxCellMeasIdle-r16)) OF EUTRA-PhysCellId

BeamMeasConfigIdle-NR-r16 ::= SEQUENCE {

 reportQuantityRS-Indexes-r16 ENUMERATED {rsrp, rsrq, both} OPTIONAL, -- Need FFS

 maxNrofRS-IndexesToReport-r16 INTEGER (1..FFS) OPTIONAL, -- Need FFS

 includeBeamMeasurements-r16 BOOLEAN

}

RSRQ-RangeEUTRA-r16 ::= INTEGER (-30..46)

-- TAG-MEASIDLECONFIG-STOP

-- ASN1STOP

[…]

#### – *MeasResultListIdle*

The IE *MeasResultListIdle* covers measured results performed in RRC\_IDLE and RRC\_INACTIVE.

*MeasResultListIdle* information element

-- ASN1START

-- TAG-MEASRESULTLISTIDLE-START

MeasResultListIdle-r16 ::= SEQUENCE {

 measResultServingCell-r16 SEQUENCE {

 rsrpResult-r16 RSRP-Range,

 rsrqResult-r16 RSRQ-Range

 resultsSSB-Indexes-r16 ResultsPerSSB-IndexList-r16 OPTIONAL

 },

 measResultsPerCarrierIdle-r16 SEQUENCE {(SIZE (1..FFS)) OF MeasResultIdle-r16,

 ...

}

MeasResultIdle-r16 ::= SEQUENCE {

 measResultNeighCells-r16 CHOICE {

 measResultIdleListNR-r16 MeasResultIdleListNR-r16,

 measResultIdleListEUTRA-r16 MeasResultIdleListEUTRA-r16,

 ...

 } OPTIONAL,

 ...

}

MeasResultIdleListNR-r16 ::= SEQUENCE {

 carrierFreqNR-r16 ARFCN-ValueNR,

 measResultsPerNRCellIdle-r16 SEQUENCE {(SIZE (1..maxCellMeasIdle-r16)) OF MeasResultIdleNR-r16,

 ...

}

MeasResultIdleNR-r16 ::= SEQUENCE {

 physCellId-r16 PhysCellId,

 measResultNR-r16 SEQUENCE {

 rsrpResult-r16 RSRP-Range OPTIONAL,

 rsrqResult-r16 RSRQ-Range OPTIONAL,

 resultsSSB-Indexes-r16 ResultsPerSSB-IndexList-r16 OPTIONAL

 },

 ...

}

MeasResultIdleListEUTRA-r16 ::= SEQUENCE {

 carrierFreqEUTRA-r16 ARFCN-ValueEUTRA,

 measResultsPerEUTRACellIdle-r16 SEQUENCE {(SIZE (1..maxCellMeasIdle-r16)) OF MeasResultIdleEUTRA-r16, ...

}

MeasResultIdleEUTRA-r16 ::= SEQUENCE {

 eutra-PhysCellId-r16 EUTRA-PhysCellId,

 measResultEUTRA-r16 SEQUENCE {

 rsrpResult-r16 RSRP-RangeEUTRA OPTIONAL,

 rsrqResult-r16 RSRQ-RangeEUTRA-r16 OPTIONAL

 },

 ...

}

ResultsPerSSB-IndexList-r16 ::= SEQUENCE (SIZE (1.. FFS)) OF ResultsPerSSB-IndexIdle-r16

ResultsPerSSB-IndexIdle-r16 ::= SEQUENCE {

 ssb-Index-r16 SSB-Index,

 ssb-Results-r16 SEQUENCE {

 ssbRsrpResult-r16 RSRP-Range OPTIONAL,

 ssbRsrqResult-r16 RSRQ-Range OPTIONAL

 } OPTIONAL

}

-- TAG-MEASRESULTLISTIDLE-STOP

-- ASN1STOP

END OF CHANGES

START OF CHANGES

### 6.3.3 UE capability information elements

#### – *UE-MRDC-Capability*

The IE *UE-MRDC-Capability* is used to convey the UE Radio Access Capability Parameters for MR-DC, see TS 38.306 [26].

*UE-MRDC-Capability* information element

-- ASN1START

-- TAG-UE-MRDC-CAPABILITY-START

UE-MRDC-Capability ::= SEQUENCE {

 measAndMobParametersMRDC MeasAndMobParametersMRDC OPTIONAL,

 phy-ParametersMRDC-v1530 Phy-ParametersMRDC OPTIONAL,

 rf-ParametersMRDC RF-ParametersMRDC,

 generalParametersMRDC GeneralParametersMRDC-XDD-Diff OPTIONAL,

 fdd-Add-UE-MRDC-Capabilities UE-MRDC-CapabilityAddXDD-Mode OPTIONAL,

 tdd-Add-UE-MRDC-Capabilities UE-MRDC-CapabilityAddXDD-Mode OPTIONAL,

 fr1-Add-UE-MRDC-Capabilities UE-MRDC-CapabilityAddFRX-Mode OPTIONAL,

 fr2-Add-UE-MRDC-Capabilities UE-MRDC-CapabilityAddFRX-Mode OPTIONAL,

 featureSetCombinations SEQUENCE (SIZE (1..maxFeatureSetCombinations)) OF FeatureSetCombination OPTIONAL,

 pdcp-ParametersMRDC-v1530 PDCP-ParametersMRDC OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension UE-MRDC-Capability-v15xy OPTIONAL

}

UE-MRDC-Capability-v1560 ::= SEQUENCE {

 appliedFilters OCTET STRING (CONTAINING UE-CapabilityRequestFilterNR-v15xy) OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

Editor’s note: The need for capability indicating support for maintaining SCG on resume is FFS.

UE-MRDC-CapabilityAddXDD-Mode ::= SEQUENCE {

 measAndMobParametersMRDC-XDD-Diff MeasAndMobParametersMRDC-XDD-Diff OPTIONAL,

 generalParametersMRDC-XDD-Diff GeneralParametersMRDC-XDD-Diff OPTIONAL

}

UE-MRDC-CapabilityAddFRX-Mode ::= SEQUENCE {

 measAndMobParametersMRDC-FRX-Diff MeasAndMobParametersMRDC-FRX-Diff

}

GeneralParametersMRDC-XDD-Diff ::= SEQUENCE {

 splitSRB-WithOneUL-Path ENUMERATED {supported} OPTIONAL,

 splitDRB-withUL-Both-MCG-SCG ENUMERATED {supported} OPTIONAL,

 srb3 ENUMERATED {supported} OPTIONAL,

 v2x-EUTRA-v1530 ENUMERATED {supported} OPTIONAL,

 ...

}

-- TAG-UE-MRDC-CAPABILITY-STOP

-- ASN1STOP

|  |
| --- |
| *UE-MRDC-Capability* field descriptions |
| ***featureSetCombinations***A list of *FeatureSetCombination*:s for MR-DC. The *FeatureSetDownlink*:s and *FeatureSetUplink*:s referred to from these *FeatureSetCombination*:s are defined in the *featureSets* list in *UE-NR-Capability*. |
|  |

[…]

#### – *UE-NR-Capability*

The IE *UE-NR-Capability* is used to convey the NR UE Radio Access Capability Parameters, see TS 38.306 [26].

*UE-NR-Capability* information element

-- ASN1START

-- TAG-UE-NR-CAPABILITY-START

UE-NR-Capability ::= SEQUENCE {

 accessStratumRelease AccessStratumRelease,

 pdcp-Parameters PDCP-Parameters,

 rlc-Parameters RLC-Parameters OPTIONAL,

 mac-Parameters MAC-Parameters OPTIONAL,

 phy-Parameters Phy-Parameters,

 rf-Parameters RF-Parameters,

 measAndMobParameters MeasAndMobParameters OPTIONAL,

 fdd-Add-UE-NR-Capabilities UE-NR-CapabilityAddXDD-Mode OPTIONAL,

 tdd-Add-UE-NR-Capabilities UE-NR-CapabilityAddXDD-Mode OPTIONAL,

 fr1-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

 fr2-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

 featureSets FeatureSets OPTIONAL,

 featureSetCombinations SEQUENCE (SIZE (1..maxFeatureSetCombinations)) OF FeatureSetCombination OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension UE-NR-Capability-v1530 OPTIONAL

}

UE-NR-Capability-v1530 ::= SEQUENCE {

 fdd-Add-UE-NR-Capabilities-v1530 UE-NR-CapabilityAddXDD-Mode-v1530 OPTIONAL,

 tdd-Add-UE-NR-Capabilities-v1530 UE-NR-CapabilityAddXDD-Mode-v1530 OPTIONAL,

 dummy ENUMERATED {supported} OPTIONAL,

 interRAT-Parameters InterRAT-Parameters OPTIONAL,

 inactiveState ENUMERATED {supported} OPTIONAL,

 delayBudgetReporting ENUMERATED {supported} OPTIONAL,

 nonCriticalExtension UE-NR-Capability-v1540 OPTIONAL

}

UE-NR-Capability-v1540 ::= SEQUENCE {

 sdap-Parameters SDAP-Parameters OPTIONAL,

 overheatingInd ENUMERATED {supported} OPTIONAL,

 ims-Parameters IMS-Parameters OPTIONAL,

 fr1-Add-UE-NR-Capabilities-v1540 UE-NR-CapabilityAddFRX-Mode-v1540 OPTIONAL,

 fr2-Add-UE-NR-Capabilities-v1540 UE-NR-CapabilityAddFRX-Mode-v1540 OPTIONAL,

 fr1-fr2-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

 nonCriticalExtension UE-NR-Capability-v1550 OPTIONAL

}

UE-NR-Capability-v1550 ::= SEQUENCE {

 reducedCP-Latency ENUMERATED {supported} OPTIONAL,

 nonCriticalExtension UE-NR-Capability-v1560 OPTIONAL

}

UE-NR-Capability-v1560 ::= SEQUENCE {

 nrdc-Parameters NRDC-Parameters OPTIONAL,

 receivedFilters OCTET STRING (CONTAINING UECapabilityEnquiry-v1560-IEs) OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

Editor’s note: The need for capability indicating support for maintaining MCG SCells on resume is FFS.

UE-NR-CapabilityAddXDD-Mode ::= SEQUENCE {

 phy-ParametersXDD-Diff Phy-ParametersXDD-Diff OPTIONAL,

 mac-ParametersXDD-Diff MAC-ParametersXDD-Diff OPTIONAL,

 measAndMobParametersXDD-Diff MeasAndMobParametersXDD-Diff OPTIONAL

}

UE-NR-CapabilityAddXDD-Mode-v1530 ::= SEQUENCE {

 eutra-ParametersXDD-Diff EUTRA-ParametersXDD-Diff

}

UE-NR-CapabilityAddFRX-Mode ::= SEQUENCE {

 phy-ParametersFRX-Diff Phy-ParametersFRX-Diff OPTIONAL,

 measAndMobParametersFRX-Diff MeasAndMobParametersFRX-Diff OPTIONAL

}

UE-NR-CapabilityAddFRX-Mode-v1540 ::= SEQUENCE {

 ims-ParametersFRX-Diff IMS-ParametersFRX-Diff OPTIONAL

}

-- TAG-UE-NR-CAPABILITY-STOP

-- ASN1STOP

|  |
| --- |
| *UE-NR-Capability* field descriptions |
| ***featureSetCombinations***A list of *FeatureSetCombination:s* for NR (not for MR-DC). The *FeatureSetDownlink:s* and *FeatureSetUplink:s* referred to from these *FeatureSetCombination:s* are defined in the *featureSets* list in *UE-NR-Capability*. |
|  |
|  |

END OF CHANGES

START OF CHANGES

## 6.4 RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxBandComb INTEGER ::= 65536 -- Maximum number of DL band combinations

maxCellBlack INTEGER ::= 16 -- Maximum number of NR blacklisted cell ranges in SIB3, SIB4

maxCellInter INTEGER ::= 16 -- Maximum number of inter-Freq cells listed in SIB4

maxCellIntra INTEGER ::= 16 -- Maximum number of intra-Freq cells listed in SIB3

maxCellMeasEUTRA INTEGER ::= 32 -- Maximum number of cells in E-UTRAN

maxCellMeasIdle-r16 INTEGER ::= FFS -- Maximum number of cells per carrier for IDLE mode measurements

maxEARFCN INTEGER ::= 262143 -- Maximum value of E-UTRA carrier frequency

maxEUTRA-CellBlack INTEGER ::= 16 -- Maximum number of E-UTRA blacklisted physical cell identity ranges

 -- in SIB5

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

maxFreqIdle-r16 INTEGER ::= FFS -- Maximum number of carrier frequencies for IDLE mode measurements

maxMultiBands INTEGER ::= 8 -- Maximum number of additional frequency bands that a cell belongs to

maxNARFCN INTEGER ::= 3279165 -- Maximum value of NR carrier frequency

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

maxNrofServingCells INTEGER ::= 32 -- Max number of serving cells (SpCells + SCells)

maxNrofServingCells-1 INTEGER ::= 31 -- Max number of serving cells (SpCell + SCells) per cell group

maxNrofAggregatedCellsPerCellGroup INTEGER ::= 16

maxNrofSCells INTEGER ::= 31 -- Max number of secondary serving cells per cell group

maxNrofCellMeas INTEGER ::= 32 -- Maximum number of entries in each of the cell lists in a measurement

 -- object

maxNrofSS-BlocksToAverage INTEGER ::= 16 -- Max number for the (max) number of SS blocks to average to determine cell

 -- measurement

maxNrofCSI-RS-ResourcesToAverage INTEGER ::= 16 -- Max number for the (max) number of CSI-RS to average to determine cell

 -- measurement

maxNrofDL-Allocations INTEGER ::= 16 -- Maximum number of PDSCH time domain resource allocations

maxNrofSR-ConfigPerCellGroup INTEGER ::= 8 -- Maximum number of SR configurations per cell group

maxLCG-ID INTEGER ::= 7 -- Maximum value of LCG ID

maxLC-ID INTEGER ::= 32 -- Maximum value of Logical Channel ID

maxNrofTAGs INTEGER ::= 4 -- Maximum number of Timing Advance Groups

maxNrofTAGs-1 INTEGER ::= 3 -- Maximum number of Timing Advance Groups minus 1

maxNrofBWPs INTEGER ::= 4 -- Maximum number of BWPs per serving cell

maxNrofCombIDC INTEGER ::= 128 -- Maximum number of reported MR-DC combinations for IDC

maxNrofSymbols-1 INTEGER ::= 13 -- Maximum index identifying a symbol within a slot (14 symbols, indexed

 -- from 0..13)

maxNrofSlots INTEGER ::= 320 -- Maximum number of slots in a 10 ms period

maxNrofSlots-1 INTEGER ::= 319 -- Maximum number of slots in a 10 ms period minus 1

maxNrofPhysicalResourceBlocks INTEGER ::= 275 -- Maximum number of PRBs

maxNrofPhysicalResourceBlocks-1 INTEGER ::= 274 -- Maximum number of PRBs minus 1

maxNrofPhysicalResourceBlocksPlus1 INTEGER ::= 276 -- Maximum number of PRBs plus 1

maxNrofControlResourceSets-1 INTEGER ::= 11 -- Max number of CoReSets configurable on a serving cell minus 1

maxCoReSetDuration INTEGER ::= 3 -- Max number of OFDM symbols in a control resource set

maxNrofSearchSpaces-1 INTEGER ::= 39 -- Max number of Search Spaces minus 1

maxSFI-DCI-PayloadSize INTEGER ::= 128 -- Max number payload of a DCI scrambled with SFI-RNTI

maxSFI-DCI-PayloadSize-1 INTEGER ::= 127 -- Max number payload of a DCI scrambled with SFI-RNTI minus 1

maxINT-DCI-PayloadSize INTEGER ::= 126 -- Max number payload of a DCI scrambled with INT-RNTI

maxINT-DCI-PayloadSize-1 INTEGER ::= 125 -- Max number payload of a DCI scrambled with INT-RNTI minus 1

maxNrofRateMatchPatterns INTEGER ::= 4 -- Max number of rate matching patterns that may be configured

maxNrofRateMatchPatterns-1 INTEGER ::= 3 -- Max number of rate matching patterns that may be configured minus 1

maxNrofRateMatchPatternsPerGroup INTEGER ::= 8 -- Max number of rate matching patterns that may be configured in one group

maxNrofCSI-ReportConfigurations INTEGER ::= 48 -- Maximum number of report configurations

maxNrofCSI-ReportConfigurations-1 INTEGER ::= 47 -- Maximum number of report configurations minus 1

maxNrofCSI-ResourceConfigurations INTEGER ::= 112 -- Maximum number of resource configurations

maxNrofCSI-ResourceConfigurations-1 INTEGER ::= 111 -- Maximum number of resource configurations minus 1

maxNrofAP-CSI-RS-ResourcesPerSet INTEGER ::= 16

maxNrOfCSI-AperiodicTriggers INTEGER ::= 128 -- Maximum number of triggers for aperiodic CSI reporting

maxNrofReportConfigPerAperiodicTrigger INTEGER ::= 16 -- Maximum number of report configurations per trigger state for aperiodic

 -- reporting

maxNrofNZP-CSI-RS-Resources INTEGER ::= 192 -- Maximum number of Non-Zero-Power (NZP) CSI-RS resources

maxNrofNZP-CSI-RS-Resources-1 INTEGER ::= 191 -- Maximum number of Non-Zero-Power (NZP) CSI-RS resources minus 1

maxNrofNZP-CSI-RS-ResourcesPerSet INTEGER ::= 64 -- Maximum number of NZP CSI-RS resources per resource set

maxNrofNZP-CSI-RS-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-RS resources per cell

maxNrofNZP-CSI-RS-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-RS resources per cell minus 1

maxNrofNZP-CSI-RS-ResourceSetsPerConfig INTEGER ::= 16 -- Maximum number of resource sets per resource configuration

maxNrofNZP-CSI-RS-ResourcesPerConfig INTEGER ::= 128 -- Maximum number of resources per resource configuration

maxNrofZP-CSI-RS-Resources INTEGER ::= 32 -- Maximum number of Zero-Power (ZP) CSI-RS resources

maxNrofZP-CSI-RS-Resources-1 INTEGER ::= 31 -- Maximum number of Zero-Power (ZP) CSI-RS resources minus 1

maxNrofZP-CSI-RS-ResourceSets-1 INTEGER ::= 15

maxNrofZP-CSI-RS-ResourcesPerSet INTEGER ::= 16

maxNrofZP-CSI-RS-ResourceSets INTEGER ::= 16

maxNrofCSI-IM-Resources INTEGER ::= 32 -- Maximum number of CSI-IM resources. See CSI-IM-ResourceMax in 38.214.

maxNrofCSI-IM-Resources-1 INTEGER ::= 31 -- Maximum number of CSI-IM resources minus 1. See CSI-IM-ResourceMax

 -- in 38.214.

maxNrofCSI-IM-ResourcesPerSet INTEGER ::= 8 -- Maximum number of CSI-IM resources per set. See CSI-IM-ResourcePerSetMax

 -- in 38.214

maxNrofCSI-IM-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-IM resources per cell

maxNrofCSI-IM-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-IM resources per cell minus 1

maxNrofCSI-IM-ResourceSetsPerConfig INTEGER ::= 16 -- Maximum number of CSI IM resource sets per resource configuration

maxNrofCSI-SSB-ResourcePerSet INTEGER ::= 64 -- Maximum number of SSB resources in a resource set

maxNrofCSI-SSB-ResourceSets INTEGER ::= 64 -- Maximum number of CSI SSB resource sets per cell

maxNrofCSI-SSB-ResourceSets-1 INTEGER ::= 63 -- Maximum number of CSI SSB resource sets per cell minus 1

maxNrofCSI-SSB-ResourceSetsPerConfig INTEGER ::= 1 -- Maximum number of CSI SSB resource sets per resource configuration

maxNrofFailureDetectionResources INTEGER ::= 10 -- Maximum number of failure detection resources

maxNrofFailureDetectionResources-1 INTEGER ::= 9 -- Maximum number of failure detection resources minus 1

maxNrofObjectId INTEGER ::= 64 -- Maximum number of measurement objects

maxNrofPageRec INTEGER ::= 32 -- Maximum number of page records

maxNrofPCI-Ranges INTEGER ::= 8 -- Maximum number of PCI ranges

maxPLMN INTEGER ::= 12 -- Maximum number of PLMNs broadcast and reported by UE at establisghment

maxNrofCSI-RS-ResourcesRRM INTEGER ::= 96 -- Maximum number of CSI-RS resources for an RRM measurement object

maxNrofCSI-RS-ResourcesRRM-1 INTEGER ::= 95 -- Maximum number of CSI-RS resources for an RRM measurement object minus 1

maxNrofMeasId INTEGER ::= 64 -- Maximum number of configured measurements

maxNrofQuantityConfig INTEGER ::= 2 -- Maximum number of quantity configurations

maxNrofCSI-RS-CellsRRM INTEGER ::= 96 -- Maximum number of cells with CSI-RS resources for an RRM measurement

 -- object

maxNrofSRS-ResourceSets INTEGER ::= 16 -- Maximum number of SRS resource sets in a BWP.

maxNrofSRS-ResourceSets-1 INTEGER ::= 15 -- Maximum number of SRS resource sets in a BWP minus 1.

maxNrofSRS-Resources INTEGER ::= 64 -- Maximum number of SRS resources.

maxNrofSRS-Resources-1 INTEGER ::= 63 -- Maximum number of SRS resources in an SRS resource set minus 1.

maxNrofSRS-ResourcesPerSet INTEGER ::= 16 -- Maximum number of SRS resources in an SRS resource set

maxNrofSRS-TriggerStates-1 INTEGER ::= 3 -- Maximum number of SRS trigger states minus 1, i.e., the largest code

 -- point.

maxNrofSRS-TriggerStates-2 INTEGER ::= 2 -- Maximum number of SRS trigger states minus 2.

maxRAT-CapabilityContainers INTEGER ::= 8 -- Maximum number of interworking RAT containers (incl NR and MRDC)

maxSimultaneousBands INTEGER ::= 32 -- Maximum number of simultaneously aggregated bands

maxNrofSlotFormatCombinationsPerSet INTEGER ::= 512 -- Maximum number of Slot Format Combinations in a SF-Set.

maxNrofSlotFormatCombinationsPerSet-1 INTEGER ::= 511 -- Maximum number of Slot Format Combinations in a SF-Set minus 1.

maxNrofPUCCH-Resources INTEGER ::= 128

maxNrofPUCCH-Resources-1 INTEGER ::= 127

maxNrofPUCCH-ResourceSets INTEGER ::= 4 -- Maximum number of PUCCH Resource Sets

maxNrofPUCCH-ResourceSets-1 INTEGER ::= 3 -- Maximum number of PUCCH Resource Sets minus 1.

maxNrofPUCCH-ResourcesPerSet INTEGER ::= 32 -- Maximum number of PUCCH Resources per PUCCH-Resour©ceSet

maxNrofPUCCH-P0-PerSet INTEGER ::= 8 -- Maximum number of P0-pucch present in a p0-pucch set

maxNrofPUCCH-PathlossReferenceRSs INTEGER ::= 4 -- Maximum number of RSs used as pathloss reference for PUCCH power control.

maxNrofPUCCH-PathlossReferenceRSs-1 INTEGER ::= 3 -- Maximum number of RSs used as pathloss reference for PUCCH power

 -- control minus 1.

maxNrofP0-PUSCH-AlphaSets INTEGER ::= 30 -- Maximum number of P0-pusch-alpha-sets (see 38,213, clause 7.1)

maxNrofP0-PUSCH-AlphaSets-1 INTEGER ::= 29 -- Maximum number of P0-pusch-alpha-sets minus 1 (see 38,213, clause 7.1)

maxNrofPUSCH-PathlossReferenceRSs INTEGER ::= 4 -- Maximum number of RSs used as pathloss reference for PUSCH power control.

maxNrofPUSCH-PathlossReferenceRSs-1 INTEGER ::= 3 -- Maximum number of RSs used as pathloss reference for PUSCH power

 -- control minus 1.

maxNrofNAICS-Entries INTEGER ::= 8 -- Maximum number of supported NAICS capability set

maxBands INTEGER ::= 1024 -- Maximum number of supported bands in UE capability.

maxBandsMRDC INTEGER ::= 1280

maxBandsEUTRA INTEGER ::= 256

maxCellReport INTEGER ::= 8

maxDRB INTEGER ::= 29 -- Maximum number of DRBs (that can be added in DRB-ToAddModLIst).

maxFreq INTEGER ::= 8 -- Max number of frequencies.

maxFreqIDC-MRDC INTEGER ::= 32 -- Maximum number of candidate NR frequencies for MR-DC IDC indication

maxNrofCandidateBeams INTEGER ::= 16 -- Max number of PRACH-ResourceDedicatedBFR that in BFR config.

maxNrofPCIsPerSMTC INTEGER ::= 64 -- Maximun number of PCIs per SMTC.

maxNrofQFIs INTEGER ::= 64

maxNrOfSemiPersistentPUSCH-Triggers INTEGER ::= 64 -- Maximum number of triggers for semi persistent reporting on PUSCH

maxNrofSR-Resources INTEGER ::= 8 -- Maximum number of SR resources per BWP in a cell.

maxNrofSlotFormatsPerCombination INTEGER ::= 256

maxNrofSpatialRelationInfos INTEGER ::= 8

maxNrofIndexesToReport INTEGER ::= 32

maxNrofIndexesToReport2 INTEGER ::= 64

maxNrofSSBs-1 INTEGER ::= 63 -- Maximum number of SSB resources in a resource set minus 1.

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

maxNrofTCI-StatesPDCCH INTEGER ::= 64

maxNrofTCI-States INTEGER ::= 128 -- Maximum number of TCI states.

maxNrofTCI-States-1 INTEGER ::= 127 -- Maximum number of TCI states minus 1.

maxNrofUL-Allocations INTEGER ::= 16 -- Maximum number of PUSCH time domain resource allocations.

maxQFI INTEGER ::= 63

maxRA-CSIRS-Resources INTEGER ::= 96

maxRA-OccasionsPerCSIRS INTEGER ::= 64 -- Maximum number of RA occasions for one CSI-RS

maxRA-Occasions-1 INTEGER ::= 511 -- Maximum number of RA occasions in the system

maxRA-SSB-Resources INTEGER ::= 64

maxSCSs INTEGER ::= 5

maxSecondaryCellGroups INTEGER ::= 3

maxNrofServingCellsEUTRA INTEGER ::= 32

maxMBSFN-Allocations INTEGER ::= 8

maxNrofMultiBands INTEGER ::= 8

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

maxReportConfigId INTEGER ::= 64

maxNrofCodebooks INTEGER ::= 16 -- Maximum number of codebooks suppoted by the UE

maxNrofCSI-RS-Resources INTEGER ::= 7 -- Maximum number of codebook resources supported by the UE

maxNrofSRI-PUSCH-Mappings INTEGER ::= 16

maxNrofSRI-PUSCH-Mappings-1 INTEGER ::= 15

maxSIB INTEGER::= 32 -- Maximum number of SIBs

maxSI-Message INTEGER::= 32 -- Maximum number of SI messages

maxPO-perPF INTEGER ::= 4 -- Maximum number of paging occasion per paging frame

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

maxBarringInfoSet INTEGER ::= 8 -- Maximum number of Access Categories

maxCellEUTRA INTEGER ::= 8 -- Maximum number of E-UTRA cells in SIB list

maxEUTRA-Carrier INTEGER ::= 8 -- Maximum number of E-UTRA carriers in SIB list

maxPLMNIdentities INTEGER ::= 8 -- Maximum number of PLMN identites in RAN area configurations

maxDownlinkFeatureSets INTEGER ::= 1024 -- (for NR DL) Total number of FeatureSets (size of the pool)

maxUplinkFeatureSets INTEGER ::= 1024 -- (for NR UL) Total number of FeatureSets (size of the pool)

maxEUTRA-DL-FeatureSets INTEGER ::= 256 -- (for E-UTRA) Total number of FeatureSets (size of the pool)

maxEUTRA-UL-FeatureSets INTEGER ::= 256 -- (for E-UTRA) Total number of FeatureSets (size of the pool)

maxFeatureSetsPerBand INTEGER ::= 128 -- (for NR) The number of feature sets associated with one band.

maxPerCC-FeatureSets INTEGER ::= 1024 -- (for NR) Total number of CC-specific FeatureSets (size of the pool)

maxFeatureSetCombinations INTEGER ::= 1024 -- (for MR-DC/NR)Total number of Feature set combinations (size of the

 -- pool)

maxInterRAT-RSTD-Freq INTEGER ::= 3

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP

-- ASN1STOP

### – End of NR-RRC-Definitions

-- ASN1START

END

-- ASN1STOP

END OF CHANGES

START OF CHANGES

# 7 Variables and constants

## 7.1 Timers

### 7.1.1 Timers (Informative)

| Timer | Start | Stop | At expiry |
| --- | --- | --- | --- |
| T300 | *Upon transmission of RRCSetupRequest.* | Upon reception of *RRCSetup* or *RRCReject* message, cell re-selection and upon abortion of connection establishment by upper layers. | Perform the actions as specified in 5.3.3.7.  |
| T301 | Upon transmission of *RRCReestabilshmentRequest* | Upon reception of *RRCReestablishment* or *RRCSetup*message as well as when the selected cell becomes unsuitable | Go to RRC\_IDLE |
| T302 | Upon reception of *RRCReject* while performing RRC connection establishment or resume, upon reception of *RRCRelease* with waitTime. | Upon entering RRC\_CONNECTED or RRC\_IDLE, upon cell re-selection and upon reception of *RRCReject* message. | Inform upper layers about barring alleviation as specified in 5.3.14.4 |
| T304 | Upon reception of *RRCReconfiguration* message including *reconfigurationWithSync* | Upon successful completion of random access on the corresponding SpCellFor T304 of SCG, upon SCG release | For T304 of MCG, in case of the handover from NR or intra-NR handover, initiate the RRC re-establishment procedure; In case of handover to NR, perform the actions defined in the specifications applicable for the source RAT.For T304 of SCG, inform network about the reconfiguration with sync failure by initiating the SCG failure information procedure as specified in 5.7.3. |
| T310 | Upon detecting physical layer problems for the SpCell 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 SpCell, upon receiving RRCReconfiguration with *reconfigurationWithSync* for that cell group, and upon initiating the connection re-establishment procedure.Upon SCG release, if the T310 is kept in SCG. | If the T310 is kept in MCG: If AS security is not activated: go to RRC\_IDLE else: initiate the connection MCG failure information procedure as specified in 5.7.y or the re-establishment procedure as specified in 5.3.7.If the T310 is kept in SCG, Inform E-UTRAN/NR about the SCG radio link failure by initiating the SCG failure information procedure as specified in 5.7.3. |
| T311 | Upon initiating the RRC connection re-establishment procedure | Upon selection of a suitable NR cell or a cell using another RAT. | Enter RRC\_IDLE |
| T319 | *Upon transmission of RRCResumeRequest* or *RRCResumeRequest1.* | Upon reception of *RRCResume,* *RRCSetup, RRCRelease, RRCRelease with suspendConfig* or *RRCReject* message, cell re-selection and upon abortion of connection establishment by upper layers. | Perform the actions as specified in 5.3.13.5. |
| T320 | *Upon reception of t320 or upon cell (re)selection to NR from another RAT with validity time configured for dedicated priorities (in which case the remaining validity time is applied).* | Upon entering RRC\_CONNECTED, upon reception of *RRCRelease*, 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). | 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 *cgi-info*, 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. |
| T325 | Upon reception of *RRCRelease* message with *deprioritisationTimer*. |  | Stop deprioritisation of all frequencies or NR signalled by *RRCRelease.* |
| T342 | Upon transmitting UEAssistanceInformation message with DelayBudgetReport. | Upon initiating the connection re-establishment/resume procedures, and upon receiving *delayBudgetReportingConfig* set to *release.* | No action. |
| T345 | Upon transmitting *UEAssistanceInformation* message with *overheatingAssistance* | Upon initiating the connection re-establishment procedure and upon initiating the connection resumption procedure | No action. |
| T380 | Upon reception of t380 in *RRCRelease.* | Upon reception of *RRCResume*, *RRCSetup* or *RRCRelease*. | Perform the actions as specified in 5.3.13. |
| T390 | 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 cell (re)selection, upon entering RRC\_CONNECTED, upon reception of *RRCReconfiguration* including *reconfigurationWithSync*, upon change of PCell while in RRC\_CONNECTED, upon reception of *MobilityFromNRCommand*, or upon reception of *RRCRelease*. | Perform the actions as specified in 5.3.14.4. |
| T331 | Upon receiving *RRCRelease* message with *measIdleDuration* | Upon receiving *RRCSetup.* | Perform the actions as specified in 5.7.x.3. |
| T316 | Upon transmission of the *MCGFailureInformation* message | Upon resumption of MCG transmission, upon reception of *RRCRelease,* or upon initiaitng the re-establishment procedure,  | Perform the actions as specified in 5.7.y.5. |

END OF CHANGES

START OF CHANGES

## 7.4 UE variables

#### – *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 NR inter-frequency measurements.

*VarMeasIdleConfig* UE variable

-- ASN1START

-- TAG-VARMEASIDLECONFIG-START

VarMeasIdleConfig-r16 ::= SEQUENCE {

 measIdleCarrierListNR-r16 NR-CarrierList-r16 OPTIONAL,

 measIdleCarrierListEUTRA-r16 EUTRA-CarrierList-r16 OPTIONAL,

 measIdleDuration-r16 FFS-Value

}

-- TAG-VARMEASIDLECONFIG-STOP

-- ASN1STOP

Editor’s note: The content and structure of *VarMeasIdleConfig* is FFS.

#### – *VarMeasIdleReport*

The UE variable *VarMeasIdleReport* includes the logged measurements information.

*VarMeasIdleReport* UE variable

-- ASN1START

VarMeasIdleReport-r16 ::= SEQUENCE {

 measReportIdle-r16 MeasResultListIdle-r16

}

-- ASN1STOP

Editor’s note: The content and structure of *VarMeasIdleReport* is FFS.

# Annex B (informative): RRC Information

## B.1 Protection of RRC messages

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

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

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

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

NA… Message can never be sent after AS security activation

| Message | P | A-I | A-C | Comment |
| --- | --- | --- | --- | --- |
| *CounterCheck* | - | - | - |  |
| *CounterCheckResponse* | - | - | - |  |
| *DLInformationTransfer* | + | - | - |  |
| *DLInformationTransferMRDC* | - | - | - |  |
| *FailureInformation* | - | - | - |  |
| *LocationMeasurementIndication* | - | - | - |  |
| *MCGFailureInformation* | - | - | - |  |
| *MIB* | + | + | + |  |
| *MeasurementReport* | - | - | - | Measurement configuration may be sent prior to AS security activation. But: In order to protect privacy of UEs, *MeasurementReport* is only sent from the UE after successful AS security activation. |
| *MobilityFromNRCommand* | - | - | - |  |
| *Paging* | + | + | + |  |
| *RRCReconfiguration* | + | - | - | The message shall not be sent unprotected before AS security activation if it is used to perform handover or to establish SRB2 and DRBs. |
| *RRCReconfigurationComplete* | + | - | - | Unprotected, if sent as response to *RRCReconfiguration* which was sent before AS security activation. |
| *RRCReestablishment* | - | - | + | Integrity protection applied, but no ciphering. |
| *RRCReestablishmentComplete* | - | - | - |  |
| *RRCReestablishmentRequest* | - | - | + | This message is not protected by PDCP operation. However, a *shortMAC-I* is included. |
| *RRCReject* | + | + | + | Justification for A-I and A-C: the message can be sent in SRB0 in RRC\_INACTIVE state, after the AS security is activated. |
| *RRCRelease* | + | - | - | 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. *RRCRelease* message sent before AS security activation cannot include *deprioritisationReq, suspendConfig, redirectedCarrierInfo, cellReselectionPriorities* information fields. |
| *RRCRequest* | + | NA | NA |  |
| *RRCResume* | - | - | - |  |
| *RRCResumeComplete* | - | - | - |  |
| *RRCResumeRequest* | - | - | + | This message is not protected by PDCP operation. However, a *resumeMAC-I* is included. |
| *RRCResumeRequest1* | - | - | + | This message is not protected by PDCP operation. However, a *resumeMAC-I* is included. |
| *RRCSetup* | + | + | + | Justification for A-I and A-C: the message can be sent in SRB0 in RRC\_INACTIVE state, after the AS security is activated. |
| *RRCSetupComplete* | + | NA | NA |  |
| *RRCSystemInfoRequest* | + | + | + | Justification for A-I and A-C: the message can be sent in SRB0 in RRC\_INACTIVE state, after the AS security is activated. |
| *SIB1* | + | + | + |  |
| *SCGFailureInformation* | - | - | - |  |
| *SCGFailureInformationEUTRA* | - | - | - |  |
| *SecurityModeCommand* | + | NA | NA | Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC). |
| *SecurityModeComplete* | - | - | + | The message is sent after AS security activation. Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure. |
| *SecurityModeFailure* | + | NA | NA | Neither integrity protection nor ciphering applied. |
| *SystemInformation* | + | + | + |  |
| *UEAssistanceInformation* | - | - | - |  |
| *UECapabilityEnquiry* | + | - | - |  |
| *UECapabilityInformation* | + | - | - |  |
| *UEInformationRequest* | - | - | - |  |
| *UEInformationResponse* | - | - | - | In order to protect privacy of UEs, UEInformationResponse is only sent from the UE after successful security activation |
| *ULInformationTransfer* | + | - | - |  |
| *ULInformationTransferMRDC* | - | - | - |  |

# Annex (not part of the specification): RAN2 Agreements

This Annex contains the RAN2 agreements on Rel-16 WI for “DC and CA enhancements”. The agreements are provided verbatim for reference.This annex shall be removed once the WI is completed.

## RAN2#105

**Agreements:**

For IDLE/INACTIVE

1. Rel-16 early measurement configuration may contain both NR and LTE configuration, only NR configuration or only LTE configuration, to support various MR-DC and CA scenario. FFS on details. IDLE mode and INACTIVE mode details will be discussed separately
2. NR early measurement configuration should include NR specific measurement parameters configurations.
3. Available beam and cell level measurement results can be included in early measurement reporting if configured.

**Agreements:**

1. The configured SCells (MCG and SCG) can be configured in deactivated or activated state by RRC upon addition or after a handover. Timing requirements are up to RAN4. FFS if this applies to resume.

**Agreements**

1. MCG failure can be indicated to the network via the SCG. FFS ifvia SCells.
2. FFS how the failure is indicated, which SRBs, and which failure case the fast MCG failure recovery.
3. We will aim to have a unified solution for the failure cases that we want to address.

## RAN2#105bis

Agreement

1 For NR IDLE mode, the LTE rel-15 euCA early measurement reporting solution (i.e. via UEInformationRequest and UEInformationResponse like messages) after connection is setup will be supported.

2 For both LTE and NR, sending full idle mode measurements before security activation shall not be allowed.

FFS if some measurement information (detail TBD) related to idle mode measurements can be sent before security activation.

3 SMC and SMC complete messages will not be modified to enable the signalling of early measurements.

4 For both LTE and NR, RAN2 confirm that current specification allow that UEInformationRequest (or equivalent message to be specified in NR) can be sent by the network immediate after Security Mode Command without network having to wait for Security Mode Complete (i.e. similar to sending of Reconfiguration after SMC)

5 For NR INACTIVE mode, the LTE rel-15 euCA early measurement reporting solution (i.e. via UEInformationRequest and UEInformationResponse like messages) after connection is resumed will be supported.

6 Sending early measurement report is network controlled

7 For NR INACTIVE, the network can request early measurement report in RRCResume

8 For NR INACTIVE, early measurement reporting can be sent in RRCResumeComplete

FFS Whether agreements 7 and 8 should be applied to LTE RRCConnectionResume and RRCConnectionResumeComplete message.

Agreements

1: NR early measurements can be configured in both NR RRCRelease message and NR system information.

FFS: Whether there are differences in the configuration that can be provided by RRCRelease and SI.

2: Introduce some indication about the cell's early measurement support in NR system information.

3: To control the duration of UE performing both IDLE and INACTIVE measurements, a single validity timer (similar to measIdleDuration in LTE euCA) is mandatory indicated only in NR RRCRelease message, i.e. not included in NR SIB.

4: For both IDLE and INACTIVE early measurements, the following IEs can be optionally configured per NR frequency in both NR RRCRelease message and NR SIB:

- A list of frequencies and optionally cells (similar to measCellList in LTE euCA) the UE is required to perform early measurements.

- A cell quality threshold (similar to qualityThreshold in LTE euCA) the UE is required to report the measurement results only for the cells which met the configured thresholds.

FFS: A validity Area (similar to validityArea in LTE euCA) to indicate the list of cells within which UE is required to perform early measurements. If the UE reselects to a cell outside this list, the early measurements are no longer required (same as timer expiry).

 o If it is absent, the UE will not have area limitation of early measurements.

For SSB based measurements:

5: For both IDLE and INACTIVE early measurements, SSB frequencies to be measured can be located out of sync raster

6: For both IDLE and INACTIVE early measurements, RSRP and RSRQ can be configured as cell and beam measurement quantity.

7: For both IDLE and INACTIVE early measurements, the configuration parameters provided per SSB frequency follow the same principles as those provided in SIB2/4 for the purposes of Idle/Inactive mobility. (Details differences can be discussed at stage 3 level)

8: As LTE euCA, cell / beam SINR is not introduced as measurement quantity in NR early measurement configuration in Rel-16.

For SSB based beam level measurement configurations:

9 The UE is required to report the beam with the highest measurement quantity

FFS: Whether additional beams can be reported.

10: For both IDLE and INACTIVE early measurements, the UE can be configured with one of the 3 beam reporting types

1) No beam reporting;

2) Only beam identifier

3) Both beam identifier and quantity

FFS: Whether to support CSI-RS based NR early measurements

11: LTE UE in IDLE mode, IDLE with suspended, and INACTIVE can be configured with NR early measurements to support fast setup of (NG)EN-DC (i.e. euCA is extended to support NR measurements). Details are FFS

Agreements for MCG fast recovery:

0 MCG fast recovery targets all MRDC architecture options

1: When MCG failure occurs, UE follows SCG failure-like procedure:

i. UE does not trigger RRC connection re-establishment.

ii. UE triggers an MCG failure procedure in which a failure information message is transmitted to the network via SCG.

2: MCG fast recovery targets the following use cases MCG leg RLF

FFS: Other uses cases. Can consider in future whether the mechanism can be also be applied in the case of other MCG failures.

3 MCG fast recovery can only be triggered after AS security has been activated and the SRB2 and at least one DRB have been setup

4 MCG failure indication should include:

i. Available measurement results of MCG

ii. MCG link failure cause

iii. Available measurement results of SCG

iv. Available measurement results of non-serving cells

5: For MCG failure indication, new RRC message in introduced, e.g. MCGFailureInformation.

6: SCG leg of the split SRB1 can be used for MCG fast recovery.

FFS: If configured, SRB3 can be used for MCG fast recovery. Priority is to complete the solution based on split SRB1

7: New SRB is not introduced for MCG fast recovery.

## RAN2#106

Agreements

1: RAN2 confirms that for both LTE and NR, sending cell RSRP/RSRQ of idle mode measurements before security activation shall not be allowed.

2: RAN2 confirms that for both LTE and NR, sending cell PCI(s) with good quality and associated frequency of idle mode measurements before security activation shall not be allowed.

Agreement

1 How the UE applies filtering of beam measurements as part of early measurement reporting is left to UE implementation (Up to RAN4 to specify performance requirements for early measurement reporting)

2 The UE can report more than one beam measurement. Network can configure whether it wants to receive more than just the best beam

FFS whether the network can configure max number of beams and a threshold above which beams are reported

Agreements

1 The early measurement configuration can be different between that in RRCRelease and in SIB. If the UE receives the early measurement configuration from RRCRelease, this overrides the early measurement configuration provided in SIB (if any).

FFS: Whether some other measurement related configuration in SI (e.g. smtc) outside of the early measurement configuration can still be used.

2 A single early measurement configuration is provided in SI for idle and inactive

FFS: Whether the early measurement configuration can be kept when the UE receives the Release (to Inactive to Idle) in response to Resume Request.

3 L3 filtering is not applied to early measurement reporting

4 The UE performs the idle measurement for the frequencies in configured frequency list only when the UE support CA or MR-DC between the frequency and the serving frequency.

FFS Whether the network can provide information on support of CA/DC between frequencies to assist the UE to determine which frequencies to provide measurement for.

6 If UE reselects to a cell that does not support early measurements (as indicated by absence of an indicator in SI), the validity timer keeps running, but the UE is not required to performs measurements while camped on that cell (same as LTE euCA)

Agreement

1 SCell dormant state like LTE euCA will not be introduced in NR.

2 ‘dormancy’ behaviour will be studied as a solution for fast return to SCell utilisation for data transfer. The 'dormancy' behaviour implies that the UE stops monitoring PDCCH but continues other activities such as CSI measurements, AGC and beam management. RAN1/4 input required on feasibility and benefit.

1 Temporary RS resources at SCell activation will be studied as a solution for fast SCell activation. RAN1/4 input required on feasibility and benefit.

Agreements

1: Fast MCG recovery is not supported in case (intra and inter-RAT) handover failure

2: Fast MCG recovery is not supported in case of integrity check failure

3: Fast MCG recovery is not supported in case of RRC connection reconfiguration failure

Agreements

FFS Whether a guard timer is needed for the MCG failure indication message

1 Once the MCG failure indication is triggered, the UE shall:

- transmit the MCG failure indication;

− suspend MCG transmission for all SRBs and DRBs;

− reset MCG-MAC;

− maintain the current measurement configurations from both the MN and the SN, and continue measurements based on configuration from the MN and the SN if possible.

FFS whether switch the primaryPath to SCG is needed

2 If SCG failure is detected while MCG is suspended then initiate RRC re-establishment procedure

3 Upon receiving the MCG failure indication, the MN sends reconfiguration with sync or RRC Release to the UE via SRB1.

4 Upon reception of reconfig with sync the UE resumes MCG transmission if suspended

## RAN2#107

Agreements

1: For per-frequency SSB measurement configuration reuse the IE structure that is currently used in SIBs for cell reselection purposes.

2: The legacy SSB measurement configurations in NR SIB2/4 and LTE SIB24 are reused for NR early measurements performed in frequencies which are candidates of cell selection/reselection, i.e. not introduce new measurement configurations in NR/LTE SIB for these SSBs.

3: Same as LTE euCA, NR frequency list (not the SSB measurement configuration) can be different between RRC release and SIB. The frequency list, if provided, in RRC release message overrides the one provided in SIB.

4 For per frequency SSB measurement configuration for purpose of only early measurements, it can be included in both RRC release message and SIB. If provided in RRC release message, it overrides the one provided in SIB in the cell where the RRC Release message is received. (

FFS How UE manages the situation when an SSB measurement configuration for a given frequency is provided in SIB of the current cell and was also provided RRC Release (in an earlier cell).

Agreements

7: As in LTE euCA, the indication whether to report RSRP, RSRQ or both can be indicated in both RRC release message and SIB. If provided in RRC release, it overrides the one in SIB.

8: Similar to LTE euCA, the indication of beam reporting type (i.e. whether to, not report beam results, report only the beam index, or report both beam index and results) can be indicated in both RRC release message and SIB. If provided in RRC release, it overrides the one in SIB.

9: NR early measurement configuration is included in a new NR SIB.

10: NR early measurement configuration is included in LTE SIB5 (i.e. the SIB including LTE early measurement configurations)

11: It is not necessary to specify CSI-RS based early measurements for the case of SCell with SSB in Rel-16.

12: It is not necessary to specify CSI-RS based early measurements for the case of SCell without SSB in Rel-16.

13: In NR early measurement configuration, the UE can be configured with maximum number for beam reporting and only beams above configured threshold for cell quality derivation are required to be reported (as NR CONNECTED measurements).

14 Do not support the network provide information on network’s support of CA/DC between frequencies to assist the UE to determine which frequencies to provide NR early measurement in Rel-16.

15 Do not support a mechanism to prevent outdated early measurement reporting in Rel-16

Agreements:

1 Upon the reception of the RRCSetup message in response to RRCSetupRequest or RRCResumeRequest (while T331 is running), the UE stops T331, and deletes the dedicated idle mode measurement configuration, if any.

2: Upon the reception of the RRCReject message in response to RRCSetupRequest or RRCResumeRequest (while T331 is running), the UE keeps performing the idle mode measurements.

3: During a 2-step resume (i.e. RRCRelease in response to RRCResumeRequest), the network can release or reconfigure the idle mode measurements.

FFS whether this is delta or complete replace

4: Upon the expiry of T331 while in IDLE or INACTIVE mode, the UE deletes the dedicated idle mode measurement configuration, if any.

5: The UE deletes the early measurement results after it has successfully reported them to the network (i.e. in UEInformationResponse or RRCResumeComplete).

Agreements (Activation of SCells is not addressed by these agreements - to be discussed separately)

1 The LTE RRCConnectionResume message (Inactive to Connected) can contain the MCG SCell configuration and the associated UE behaviour in handling the SCell configuration is the same as in the Rel-15 RRC connection reconfiguration procedure.

2 In NR and LTE Rel-16, the UE maintains the MCG SCell configuration upon the initiation of the resume procedure.

3 The RRC(Connection)Resume message contains an indication to restore/resume the MCG SCells (noting that behaviour in legacy eNBs that don't support this feature needs to be considered).

4 The (LTE and NR) RRC(Connection)Resume (Inactive to Connected))message can contain the SCG configuration and the associated UE behaviour in handling the SCG configuration is the same as in the Rel-15 RRC (connection) reconfiguration procedure.

5 In NR and LTE Rel-16, the UE maintains the SCG configuration upon the initiation of the resume procedure.

6 The RRC(Connection)Resume message contains an indication to restore/resume the SCG (noting that behaviour in legacy e/gNBs that don't support this feature needs to be considered).

Agreements

1: Upon sending a MCG failure indication, UE starts a timer.

2: Upon resumption of MCG, UE stops the timer.

3: Upon expiry of the timer, UE initiates RRC connection re-establishment procedure.

4: Network can configure the timer value (no infinite value)

Agreements

1 If a UE is configured with split SRB1 with PDCP duplication, there is no need to switch the primaryPath upon detection of MCG failure since MCG failure indication will be transmitted via SCG RLC bearer of split SRB1.

2 If PDCP duplication is not activated, upon detection of MCG failure the primaryPath for split SRB1 is implicitly reconfigured to the SCG. The UE expects the network to explicitly reconfigure the primaryPath back to MCG in the MCG recovery or in a Re-establishment

Agreements

1: SRB3, if configured, can be used for MCG fast recovery.

2: For MCG fast recovery via SRB3, MCG Failure Information message in UL (same message as for SRB1 case) is encapsulated by the UE into an SN RRC message.

3: For MCG fast recovery via SRB3, the MN response message in DL (either a reconfiguration with sync or release message) is encapsulated by the SN in an SN RRC message.

FFS Transmission of the complete message