3GPP TSG-RAN WG2 Meeting #120 Toulouse, France [R2-2213002](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213002.zip)

Online, November, 2022

**Agenda item: 10.2**

**Source: Vice Chairman (Nokia)**

**Title: Report on LTE legacy, DCCA, MUSIM, Slicing, 71 GHz, XR and QoE**

**Document for: Approval**

# Organizational

Not Treated Agenda Items

- The current agenda has a number of items marked tdoc limitation: 0 and Not treated. Such Agenda items may have LS ins, and they are also not expected to be treated, but exceptions could be considered if needed.

Tdoc limitations (reminder)

Tdoc limitations doesn’t apply to Rapporteur Input, i.e.

- Assigned summary rapporteur input of the summary.

- Email / offline discussions outcomes by discussion rapporteur,

- WI rapporteurs input for WI planning etc,

- TS rapporteur input for TS maintenance

- Assigned Editor of Running CRs input to update the running CR and input of one tdoc to facilitate addressing of CR open issues.

- Contact Company of a LSin that triggers RAN2 action may submit **one tdoc** to facilitate the LS reply. This only applies to one of the contact companies in case there are several (default the first).

Tdoc limitations doesn’t apply to Input created at the meeting, revisions, assigned documents etc.

Tdoc limitations doesn’t apply to shadow / mirror CRs (Cat A).

Tdoc limitations applies to all other submitted tdocs.

Rel-17 CR

General, all correction CRs / draft CRs:

1. Rapporteurs of Rel-17 WI CRs are asked to continue their volunteer responsibility.

2. Unless otherwise explicitly agreed/indicated, max one Cat F CR per TS per WI shall be produced as outcome of the meeting. Exception: NBC aspects, if any, may need to be in a separate CR per WI (decided case by case). Note that Impact analysis is required per CR.

3. No editorial corrections for this meeting

Rel-17 UE capabilities

For NR UE capabilities the following applies:

1: As previously, work on mega CRs (one mega CR for TS 38.306 and one for TS 38.331). This work is done under Agenda Item AI 6.0.2

2: Coordinate centrally incorporation in CRs of RAN1 / RAN4 features for all Rel17 WIs. This work is done under Agenda Item AI 6.0.2 and changes are done directly to the mega CRs. There could be exceptions, case by case, where RAN1 / RAN4 features are treated under a WI-specific Agenda Item instead.

3 At the end of R2 119bis-e, endorsed WI specific UE capability CRs will be merged into the mega CRs, and the mega CRs will be provided to TSG RAN. Any exception to this need to be decided case by case.

**List of offline email discussions:**

**NOTE: the email discussion deadlines are meant to allow at least all regions to have one day to comment (other than weekend) and also give rapporteurs time to update their proposals before the meeting)**

**Email discussion deadlines**

**NOTE: No AT-meeting email discussion reports will be handled in sessions happening during Mon-Wed.**

**Deadline 1 (for Thu/Fri comebacks)**

* **Comment deadline:** Wednesday, 1600 local time (for collecting views)
* **Rapporteur proposals:** Thursday, 1100 local time (proposed outcome)
* **Document deadline:** 1h before session (discussion report)

**Organizational**

* [AT120][200] Organizational – LTE legacy, 71 GHz, DCCA, Multi-SIM, RAN slicing, QoE and XR (RAN2 VC)

Scope:

* + - Share plans for the meetings and list of ongoing email discussions for the sessions
    - Share meetings notes and agreements for review and endorsement
    - Flag LSs and in-principle agreed CRs for discussion

      Intended outcome (for LS discussion):

* + - General information sharing about the sessions

**Post-meeting email discussions**

**AT-meeting offline discussions (started earliest after first online session)**

**Dates and deadlines (see also RP-221818) – Technical Meeting**

Nov 4th, 0900 UTC **General Tdoc Submission Deadline**.

Nov 9th Topic/Agenda item Summaries: Deadline for making available by the reflector:

Nov 21-25 **Inactive period**

Dec 2nd **Deadline Short Post120 email discussions**. Short Post email discussions can be started before the meeting has ended.

**Meeting Schedule (November 14-18)**

Web conference scheduled for the duration of the meeting following the local time zone.

NOTE that this schedule may be modified on short notice.   
THE Schedule for CBs on Thursday (and Friday) will be updated on Wednesday, and the schedule for CBs on Friday may be further updated on Thursday.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Main room** | **Breakout room 1** | **Breakout room 2** | **Breakout room 3** |
| **Monday** |  |  |  |  |
| 09:00 – 10:30 | [1], [2], [3]  NR1516 CP (Johan) | Breakout to start after NR common items in the main room:  NR151617 UP (Diana)  NR17  - SDT  - IIOT URLLC  - RACH (Diana) | Breakout to start after formal opening of meeting in main room:  NR1516 (Kyeongin)  NR17 (Kyeongin). |  |
| 11:00 – 13:00 |
| 14:00 – 16:00 | NR1516 CP (Johan) | NR18 MT-SDT [0.5] (Diana)  NR18 UAV [0.5] (Diana) | NR17 (Kyeongin).  NR18 SL evolution [0.5] (Kyeongin) |
| 16:30 – 18:30 | NR17 (Johan)  - feMIMO  - Other  - Common CP  - MGE, NPN, UDC | NR18 Network Energy Saving [1] (Diana) | NRLTE1516 (Nathan)  NR17 (Nathan)  - NR Pos |
| **Tuesday** |  |  |  |  |
| 08:30 – 10:30 | NR17 (Johan)  - eIAB  - ePowSav  - TEI17 | EUTRA16+ (Tero)  - 4.4: CSI subframe sets ([R2-2211108](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211108.zip), [R2-2212602](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212602.zip), [R2-2212219](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212219.zip)), UAV ([R2-2211187](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211187.zip)), PDCP ([R2-2211386](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211386.zip), [R2-2212763](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212763.zip), [R2-2212766](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212766.zip))  - 7.1: NPUSCH 16QAM ([R2-2212961](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212961.zip)), LTE relay Stage-2 ([R2-2211364](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211364.zip)), ue-ConfigRelease in HO request ([R2-2211751](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211751.zip))  NR17 DCCA (Tero)  - 6.2.1: CHO with SN ([R2-2211791](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211791.zip), [R2-2212255](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212255.zip))  - 6.2.2: Measurements for conditional reconfigs ([R2-2212460](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212460.zip), [R2-2211760](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211760.zip)), SCG deactivation corrections ([R2-2211965](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211965.zip), [R2-2212854](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212854.zip)) | NR17 (Nathan)  - NR pos  - SL relay |  |
| 11:00 – 13:00 | NR18 Other [0.5] (Johan)  NR18 Mobile IAB [0.5] (Johan) | NR17 MUSIM (Tero)  - 6.3: NAS busy indication ([R2-2211119](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211119.zip), [R2-2211246](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211246.zip)), UAI and aperiodic gaps ([R2-2211357](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211357.zip)), MUSIM and re-establishment ([R2-2211770](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211770.zip)), miscellaneous corrections ([R2-2212111](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212111.zip), [R2-2212746](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212746.zip))  IF time allows:  - 6.3: Editorial corrections ([R2-2211801](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211801.zip), [R2-2212745](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212745.zip), [R2-2211356](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211356.zip))  NR17 71 GHz (Tero)  - 6.20.1: TCI state for RSSI ([R2-2211148](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211148.zip), [R2-2211705](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211705.zip)), multi-PDSCH scheduling ([R2-2211149](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211149.zip), [R2-2211533](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211533.zip)), CCA config ([R2-2211158](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211158.zip), [R2-2211170](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211170.zip), [R2-2211941](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211941.zip)), miscellaneous corrections ([R2-2211991](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211991.zip), [R2-2211505](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211505.zip)) | NR18 Pos [2] (Nathan) |
| 14:00 – 16:00 | NR18 feMob [2] (Johan)  - LTM | NR17 Slicing (Tero)  - 6.8: Slice-based RACH ([R2-2212696](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212696.zip)), SIB16 and slice-specific reselection priorities ([R2-2212568](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212568.zip)), slice-based reselection ([R2-2211962](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211962.zip), [R2-2211963](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211963.zip), [R2-2212152](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212152.zip), [R2-2212210](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212210.zip), [R2-2212316](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212316.zip), [R2-2212914](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212914.zip))  NR17 QoE (Tero)  - 6.14: Buffer level measurements ([R2-2212218](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212218.zip), [R2-2212464](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212464.zip)), PDU session ID signalling ([R2-2212463](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212463.zip)), clarifying SRB4 config ([R2-2211547](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211547.zip))  NR18 eQoE [0.5] (Tero)  - 8.14.2: QoE configuration ([R2-2212938](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212938.zip), [R2-2212635](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212635.zip), [R2-2212795](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212795.zip), [R2-2211800](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211800.zip))  - 8.14.4: Bearer handling ([R2-2211451](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211451.zip), [R2-2212940](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212940.zip)) | NR18 Pos [2] (Nathan) |
| 16:30 – 18:30 | NR18 feMob [2] (Johan) | NR18 XR [2] (Tero)  - 8.5.1 : Work plan ([R2-2211595](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211595.zip)), SA2 status ([R2-2211596](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211596.zip)), TR update ([R2-2212908](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212908.zip)), SA2 LS on XR ([R2-2211138](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211138.zip), [R2-2211490](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211490.zip), [R2-2212189](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212189.zip))  - 8.5.2.1 : LCH mapping ([R2-2212471](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212471.zip), [R2-2212534](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212534.zip)), UL PDU set information ([R2-2211177](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211177.zip)), PDU set-based QoS ([R2-2211718](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211718.zip))  - 8.5.2.2 : Delay-awareness in LCP ([R2-2211598](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211598.zip), [R2-2212190](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212190.zip), [R2-2211178](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211178.zip))  - 8.5.2.3 : PDU discard in lower layers ([R2-2211993](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211993.zip)), PDU discard mechanism ([R2-2212129](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212129.zip)), PDU discard usage ([R2-2212331](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212331.zip))  IF time allows:  - 8.5.4.2 : CG enhancements ([R2-2212890](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212890.zip)) | NR17 (Nathan)  - SL relay  NR18 SL relay [1.5] (Nathan) |
| **Wednesday** |  |  |  |  |
| 08:30 – 10:30 | NR18 NCR [0.5] (Sasha)  NR17 MBS (Dawid) | R17 Maint (Sergio)  - Iot NTN  - NR NTN | NR18 IDC [1] (Yi) |  |
| 11:00 – 13:00 | NR17 MBS continuation, if needed (Dawid)  NR 18 MBS [0.5] (Dawid) | R17 Maint (Sergio)  - RedCap  - Cov Enh | NR17 SONMDT (HuNan) |
| 14:00 – 16:00 | NR18 XR [2] (Tero)  - 8.5.4.2 : CG enhancements ([R2-2212890](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212890.zip)), UL assistance ([R2-2212936](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212936.zip)), PDU set retransmissions or PDU concatenation ([R2-2211601](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211601.zip))  - 8.5.4.1: BSR table and other BSR details ([R2-2211600](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211600.zip), [R2-2212517](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212517.zip))  - 8.5.3.2: UE assistance info for power saving ([R2-2211495](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211495.zip), [R2-2212632](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212632.zip))  - 8.5.3.1: DRX usage ([R2-2211180](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211180.zip), [R2-2211775](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211775.zip)), SFN wrap-around ([R2-2212886](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212886.zip), [R2-2211860](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211860.zip)) | L18 IoT-NTN [1] (Sergio) | NR18 SONMDT [1] (HuNan) |
| 16:30 – 18:30 | NR18 AIML [1] (Johan) | NR18 NTN enh [1] (Sergio) | NR18 SL relay [1.5] (Nathan) |
| **Thursday** |  |  |  |  |
| 08:30 – 10:30 | CB NR1516 (Johan)  CB NR 17 (Johan)  - feMIMO  - Other | CB Diana | CB Kyeongin |  |
| 11:00 – 13:00 | CB NR17 Johan)  - MGE, NPN, UDC | CB Diana | CB Kyeongin |
| 14:00 – 16:00 | CB NR17 (Johan)  - continuation if needed  CB NR18 (Johan)  - Other, Mob | CB EUTRA16+ (Tero)  - CRs from Offline 201 (dormant SCell state and UDC PDCP CRs)  CB NR17 DCCA (Tero)  - CRs from offline 202 (no SCG in CHO with SN, orphan CPC measId, condition splitting for SCG activation, rapporteur CRs)  CB NR17 MUSIM (Tero)  - Offline 204 (MUSIM leaving and re-establishment)  CB NR17 71 GHz (Tero)  - CRs from Offline 205 (RRC CR, TCI state for RSSI measurements CR)  IF time allows:  NR17 RAN slicing (Tero)  - Offline 206 result | CB Nathan |
| 16:30 – 18:30 | CB NR18 (Johan)  - Other, Mob IAB | NR17 Slicing (Tero)  - 6.8: SIB16 and slice-specific reselection priorities ([R2-2212568](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212568.zip)), slice-based reselection ([R2-2211962](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211962.zip), [R2-2211963](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211963.zip), [R2-2212152](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212152.zip), [R2-2212210](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212210.zip), [R2-2212316](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212316.zip), [R2-2212914](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212914.zip))  NR18 XR (Tero)  - 8.5.2.3 : PDU discard in lower layers ([R2-2211993](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211993.zip)), PDU discard mechanism ([R2-2212129](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212129.zip)), PDU discard usage ([R2-2212331](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212331.zip))  - SI status for RAN | CB Nathan |
| **Friday** |  |  |  |  |
| 08:30 – 10:30 | CB Dawid TBD | If needed: 07:30-08:30 CB Diana  R17 Maint (Sergio)  - remaining NTN things  - CBs | CB Nathan, Kyeongin |  |
| 11:00 – 13:00 | CB NR18 NCR (Sasha)  CB NR17, NR18 (Johan) | CB Sergio | CB Yi  CB HuNan |
| 14:00 – 16:00 | CB NR17, NR18 (Johan) | CB Sergio,  CB Tero (Max 30 minutes)  - Any remaining NR17 offline CBs | CB HuNan |
| 16:00 – 17:00 | Comebacks CP, (Johan) |  |  |  |

**Breaks**

Morning coffee: 10:30 to 11:00

Lunch: 13:00 to 14:00

Afternoon coffee: 16:00 to 16:30

**Offline Web Conference Schedule**

Number Title Day/Time Place Coordinator

# 4 EUTRA Rel-16 and earlier

Only essential corrections. No documents should be submitted to 4. Please submit to 4.x

## 4.1 NB-IoT and eMTC corrections Rel-16 and earlier

(NB\_IOTenh3-Core; leading WG: RAN1; REL-16; started: Jun 18; Completed: June 20; WID: RP-200293); REL-15 and Earlier NB-IoT WIs are in scope but not listed explicitly (long list).

(LTE\_eMTC5-Core; LTE\_eMTC5-Core; leading WG: RAN1; REL-16; started: Jun 18; Completed: June 20; WID: RP192875;), REL-15 and Earlier eMTC WIs are in scope but not listed explicitly (long list).

## 4.4 Other LTE corrections Rel-16 and earlier

(LTE\_feMob-Core; leading WG: RAN2; REL-16; started: Jun 18; Completed: June 20; WID: RP-190921)

(LTE\_terr\_bcast-Core, LTE\_DL\_MIMO\_EE-Core, LTE\_high\_speed\_enh2-Core; LTE TEI16 Non-positioning)

(Documents relating to Rel-16 LTE but for which there is no existing RAN WI/SI, e.g. LSs from CT/SA requesting RAN2 action)

Including TEI16, TEI15 etc corrections and issues that do not fit under any other topic.

For LTE mobility enhancements, only corrections that are LTE-specific should be submitted to this AI. Corrections that impact or are common with NR mobility enhancements should be submitted to 5.1.X instead.

Online (Tuesday) (3)

Dormant SCell and CSI subframe sets:

[R2-2211108](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211108.zip) Reply LS on the CSI periodic reporting for Dormant SCell state (R1-2208258; contact: Samsung) RAN1 LS in Rel-15 LTE\_euCA-Core To:RAN2

[R2-2212602](C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_120\\R2-2212602.zip) Support of Multiple CSI Subframe Sets on CQI-ReportPeriodicScell Samsung discussion Rel-15 LTE\_euCA-Core

*Proposal 1: RAN2 introduce the new RRC parameters cqi-pmi-ConfigIndex2Dormant and ri-ConfigIndex2Dormant in Rel-17 to support the separate configuration of single CSI subframe set and multiple CSI subframe sets on the CSI periodic report for Dormant SCell state.*

*Proposal 2: RAN2 need to check RAN1 is starting the discussion of UE capability on the separate configuration of single CSI subframe set and multiple CSI subframe sets regarding CQI-ReportPeriodicScell.*

*Proposal 3: RAN2 consider the TP for Rel-17 LTE RRC to introduce the new Rel-17 RRC parameters cqi-pmi-ConfigIndex2Dormant and ri-ConfigIndex2Dormant in Annex.*

- Huawei agrees we can follow RAN1 LS but wonders if we can discuss UE capability. Ericsson thinks we should RAN1 progress until next meeting. QC thinks we don’t need to wait for RAN1.

* P1 is agreed. RAN2 will attempt to agree to the 36.331 and 36.306 CRs in this meeting (offline 201). Can also included UE capability (companies should check with their RAN1 delegates on the situation in RAN1). RAN2 assumption is that the capability would be per-UE. Samsung will provide the draft CRs.

[R2-2212219](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212219.zip) Discussion on RAN2 impacts for the CSI periodic reporting for Dormant SCell state Huawei, HiSilicon discussion Rel-17 TEI17

*(moved from 7.1)*

[R2-2213286](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213286.zip) Support of Multiple CSI Subframe Sets on CQI-ReportPeriodicScell Samsung CR Rel-15 36.306 17.2.0 1866 - F LTE\_euCA-Core, TEI17

- Lenovo thinks we don’t need reply LS.

* CR is agreed

[R2-2213287](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213287.zip) Support of Multiple CSI Subframe Sets on CQI-ReportPeriodicScell Samsung CR Rel-15 36.331 17.2.0 4899 - F LTE\_euCA-Core, TEI17

* CR is agreed
* No LS reply (RAN1 can just read RAN2 agreements)

Online (Tuesday) (3)

Clarifying UAV reporting:

[R2-2211187](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211187.zip) Correction on measurement reporting for interference detection in UAV Samsung Electronics Co., Ltd CR Rel-15 36.300 15.13.0 1371 - F LTE\_Aerial-Core

- QC thinks this is correct. Nokia thinks the CR is not entreily correct: Reporting only happens if the threshold is crossed, which means the report can be sent at other times. Samsung thinks the proposal is still correct because we have to describe UE only reports when the number of cells is equal to or above the threshold.

* The intent of the CR is agreed. RAN2 will only attempt to capture corrections, but will not introduce further text on e.g. how the condition stops remaining valid.
* With the above, the CR is agreed (unseen) in [R2-2213206](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213206.zip)

[R2-2211188](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211188.zip) Correction on measurement reporting for interference detection in UAV Samsung Electronics Co., Ltd CR Rel-16 36.300 16.8.0 1372 - A LTE\_Aerial-Core

* With the above, the CR is agreed (unseen) in [R2-2213207](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213207.zip)

[R2-2211189](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211189.zip) Correction on measurement reporting for interference detection in UAV Samsung Electronics Co., Ltd CR Rel-17 36.300 17.2.0 1373 - A LTE\_Aerial-Core

* With the above, the CR is agreed (unseen) in [R2-2213208](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213208.zip)

Online (Tuesday) (3+3)

Missing descriptions for UDC feedback PDCP control PDU:

[R2-2211386](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211386.zip) Correction on PDCP Control PDU for UDC feedback CATT, LG Electronics, Mediatek, Huawei, HiSilicon, CMCC CR Rel-15 36.323 15.7.0 0302 - F LTE\_UDC-Core

- Lenovo agrees with intent but thinks it’s sufficient to use “feedback packet”. the sentence can be put to the end. Also thinks the cover page need not contain 5G architecture options. LGE thinks the current text is more aligned with other text in PDCP.

* Move the added text to the end of the list and remove 5G architecture options from cover page

[R2-2211387](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211387.zip) Correction on PDCP Control PDU for UDC feedback CATT, LG Electronics, Mediatek, Huawei, HiSilicon, CMCC CR Rel-16 36.323 16.6.0 0303 - A LTE\_UDC-Core

[R2-2211388](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211388.zip) Correction on PDCP Control PDU for UDC feedback CATT, LG Electronics, Mediatek, Huawei, HiSilicon, CMCC CR Rel-17 36.323 17.1.0 0304 - A LTE\_UDC-Core

* with above changes, the Rel-17 CR is agreed with magic sentence from Rel-15 onwards in [R2-2213209](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213209.zip) (Cat F)

[R2-2212763](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212763.zip) PDCP control PDU for UDC feedback LG Electronics Inc. CR Rel-15 36.323 15.7.0 0305 - F LTE\_UDC-Core

- Lenovo thinks the tx side was omitted intentionally. Also thinks it’s clear control PDUs are not ciphered.

- CATT thinks this is useful addition. QC thinks this is not essential. Ericsson agrees. Lenovo thinks we could merge with the previous CRs. LGE thinks this is needed from Rel-15.

[R2-2212764](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212764.zip) PDCP control PDU for UDC feedback LG Electronics Inc. CR Rel-16 36.323 16.6.0 0306 - A LTE\_UDC-Core

[R2-2212765](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212765.zip) PDCP control PDU for UDC feedback LG Electronics Inc. CR Rel-17 36.323 17.1.0 0307 - A LTE\_UDC-Core

* Merged to [R2-2213209](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213209.zip) (magic sentence from Rel-15 onwards)
* Provide updated CR in offline 201

[R2-2213209](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213209.zip) Correction on PDCP Control PDU for UDC feedback CATT, LG Electronics, Mediatek, Huawei, HiSilicon, CMCC CR Rel-17 36.323 17.1.0 0304 - A LTE\_UDC-Core

* CR is agreed

Online (Tuesday) (2)

Handling of data availability in PDCP for DAPS:

[R2-2212766](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212766.zip) Data available transmission for DAPS LG Electronics Inc. CR Rel-16 36.323 16.6.0 0308 - F LTE\_feMob-Core

- LGE notes similar change was discussed and agreed in NR.

* update cover page (no 5G architecture)
* With the above, the CR is agreed (unseen) in [R2-2213210](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213210.zip)

[R2-2212767](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212767.zip) Data available transmission for DAPS LG Electronics Inc. CR Rel-17 36.323 17.1.0 0309 - A LTE\_feMob-Core

* With the above, the CR is agreed (unseen) in [R2-2213211](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213211.zip)

Withdrawn:

[R2-2212343](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212343.zip) Correction to T331 handling Nokia, Nokia Shanghai Bell CR Rel-15 36.331 15.19.0 4891 - F LTE\_euCA-Core Withdrawn

[R2-2212344](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212344.zip) Correction to T331 handling Nokia, Nokia Shanghai Bell CR Rel-16 36.331 16.10.0 4892 - A LTE\_euCA-Core Withdrawn

[R2-2212345](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212345.zip) Correction to T331 handling Nokia, Nokia Shanghai Bell CR Rel-17 36.331 17.2.0 4893 - A LTE\_euCA-Core Withdrawn

# 6 NR Rel-17

## 6.2 MR DC CA further enhancements

(LTE\_NR\_DC\_enh2-Core; leading WG: RAN2; REL-17; WID: RP-201040)

Tdoc Limitation: 2 tdocs

No documents should be submitted to 6.2. Please submit to.6.2.x

Rapporteurs may provide baseline correction CRs containing smaller corrections, text clarifications etc - please contact the Rapporteur before providing contributions on those aspects.

### 6.2.0 In-Principle Agreed CRs

Online (Tuesday) (3) and Email approval (Thursday) (1)

[R2-2211759](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211759.zip) Corrections for DCCA enhancement ZTE Corporation (Rapporteur), Sanechips; Ericsson; CATT CR Rel-17 37.340 17.2.0 0350 2 F TEI17, LTE\_NR\_DC\_enh2-Core [R2-2210826](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210826.zip)

* Endorsed (other changes agreed online can be merged with this CR)

[R2-2213212](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213212.zip) Corrections for DCCA enhancement ZTE Corporation (Rapporteur), Sanechips; Ericsson; CATT CR Rel-17 37.340 17.2.0 0350 3 F TEI17, LTE\_NR\_DC\_enh2-Core

- Huawei noticed the 3GPP styles were lost and need to be corrected. QC thinks RACH was made mandatory and thinks we didn’t agree to that. ZTE clarifies that for CPAC there must always be RACH, which is different from CHO. Also Rel-16 CPC has the same thing. LGE agrees with QC and thinks we never agreed to this. Huawei thinks CPC always requires RACH.

- QC thinks this is about CHO without SN. Huawei thinks we always need RACH and this is there in Stage-3 already. Nokia thinks we are mixing two separate aspects: RACH can be omitted with CHO without SN, but for CPC we always need RACH.

* Correct document to use 3GPP styles
* With the above changes, the CR is agreed (unseen) in [R2-2213213](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213213.zip)

[R2-2212397](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212397.zip) Corrections for further MR-DC enhancements Huawei, HiSilicon CR Rel-17 38.331 17.2.0 3563 2 F LTE\_NR\_DC\_enh2-Core [R2-2210828](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210828.zip)

- Nokia wonders why there were differences to pervious version. Huawei explains this was a mistake.

* Note in comments something was removed compared to previous version.
* Endorsed (other changes agreed online can be merged with this CR)

[R2-2213318](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213318.zip) Corrections for further MR-DC enhancements Huawei, HiSilicon CR Rel-17 38.331 17.2.0 3563 2 F LTE\_NR\_DC\_enh2-Core [R2-2210828](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210828.zip)

* Add “is” to “SCG not deactivated state”
* Add NOTE agreed earlier
* With the above changes, the CR is agreed (unseen) in [R2-2213214](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213214.zip)

[R2-2212488](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212488.zip) Correction on BWP handling for deactivated SCG Ericsson, CATT CR Rel-17 38.321 17.2.0 1439 2 F LTE\_NR\_DC\_enh2-Core [R2-2210672](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210672.zip)

* Endorsed (other changes agreed online can be merged with this CR)

Withdrawn:

[R2-2212462](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212462.zip) Correction on BWP handling for deactivated SCG and the timing requirement for SCG activation Ericsson CR Rel-17 38.331 17.2.0 3702 - F LTE\_NR\_DC\_enh2-Core [R2-2210672](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210672.zip) Withdrawn

### 6.2.1 Stage-2 corrections

Including Stage-2 corrections related to DCCA WI.

Including discussion on whether there can be a target SN without SCG in CHO with SN procedure, and what would be the use case for that.

Online (Tuesday) (2+4)

CHO with SN and other corrections:

[R2-2211791](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211791.zip) Discussion on CHO with SN procedure ZTE Corporation, Sanechips discussion Rel-17 LTE\_NR\_DC\_enh2-Core

*Observation 1: In the legacy HO with SN procedure (i.e. Inter-Master Node handover with/without Secondary Node change, eNB/gNB to Master Node change), the target SN can be configured without SCG radio resources.*

*Observation 2: According to the current RRC spec, if a conditional reconfiguration is identified as a CHO candidate, the UE shall not further check whether there is a secondaryCellGroup or not. So it’s transparent to the UE whether the CHO configuration includes an SCG configuration or not.*

*Observation 3: For CHO with MR-DC, the UE just evaluates the execution conditions associated with candidate PCells, i.e. no execution condition for the target PSCell.*

*Observation 4: In CHO without SN change, if the SN is only configured bearers without SCG radio resources (e.g. SN terminated MCG bearers), the (target) SN may decide not to change the bearer type in CHO.*

*Proposal 3: If the Proposal 1 is not agreed, i.e. there must be an SCG in CHO with SN procedure, RAN2 to agree the TPs for TS 37.340, TS 38.331 and TS 36.331 in the Annex 2.*

* 1: It is up NW whether to configure an SCG in CHO with SN procedure or not, i.e. there can be a target SN without SCG in CHO with SN procedure.

*Proposal 2: If the Proposal 1 is agreed, RAN2 to agree the TP for TS 37.340 in the Annex 1.*

* Offline 202 to discuss CR contents

[R2-2212255](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212255.zip) Various Rel-17 CPAC Issues Requiring RAN2 Attention Nokia, Nokia Shanghai Bell discussion Rel-17 LTE\_NR\_DC\_enh2-Core

*Observation 1: Target SN without SCG is supported as a valid MR-DC scenario for non-conditional HO.*

*Proposal 1: To be aligned with non-conditional HO behaviour, target SN without SCG is supported in the scenario of CHO with MR-DC.*

*Observation 2: The restriction that the UE is not required to perform the measurements on measIds that are configured for conditional reconfiguration, but not linked with any candidate cell was originally introduced for Rel-17 SN-initiated CPC.*

*Proposal 2: As the inter-operability shows the consequences of extending the Rel-17 SN-initiated CPC behavior allowing the UE to ignore measIDs not linked to any conditional configuration are acceptable, RAN2 is asked to align the related NR RRC description.*

- Intel agreed there is no inter-operability issue.

- Apple wonders if we could avoid this by network behaviour since it knows if UE is Rel-16 or Rel-17 behaviour. Ericsson agrees NW can avoid it. Huawei thinks it’s not clear what UE is expected to support and that’s what we should correct. Doesn’t want to require NW to check all specification versions. Ericsson thinks there is no reason for the network to configure this for the CHO.

- Nokia agrees this was for SN-initiated CPC originally and this would not be a typical case, but just thinks we should make it clear.

- Apple thinks we can just conclude not to bring this up unless a field issue is brought up. LGE agrees there should be no interoperability issues. Ericsson thinks network can fix this if issues are found.

- Huawei thinks specification makes it clear it should be UE fault if error occurs (i.e. UE has to accept conditional measIDs even if it doesn’t use it). Thinks this can cause problems to UEs. Apple would like to avoid additional UE requirements.

- Nokia thinks the only problematic scenario is that NW configures non-used measID and many measIDs configured otherwise.

- MTK thinks this is not very essential issue.

* The network should avoid configuring UEs supporting only CHO and/or rel-16 CPC with measurements not referred to by any execution condition (measID).
* Can discuss offline if better wording for the above is found. CB Thu

**Report on Thursday:** Huawei reports there is no conclusion yet.

- Apple thinks we can just have a NOTE in specifications. Huawei clarifies there are two questions:

1) Note in the spec /chair note and 2) referring to UE capability. Nokia also prefers to have NOTE and do not need UE capability referral. Vodafone wonders which specification we would use for the NOTE? Huawei clarifies it would be 38.331

* Add a NOTE to 38.331 as per following: “NOTE X: Network avoids configuring UEs supporting only CHO and/or rel-16 CPC with measurements not referred to by any execution condition.”

[R2-2212396](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212396.zip) Discussion on CHO with SN Huawei, HiSilicon discussion Rel-17 LTE\_NR\_DC\_enh2-Core

*Proposal 1: Not support the CHO including SN without SCG.*

[R2-2212461](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212461.zip) Discussion on target SN without SCG Ericsson discussion Rel-17 LTE\_NR\_DC\_enh2-Core

*Observation 1 There can be an SN without an SCG, e.g. if the SN is only configured with SN terminated MCG bearers.*

*Proposal 1 Update the procedure for “CHO with SCG” to “CHO with SN” taking into account that there can be a target SN without an SCG.*

[R2-2212881](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212881.zip) CHO with SN procedure to include target SN without SCG case Samsung Electronics Romania discussion

*Proposal 1. RAN2 allow the target SN without SCG in CHO with SN procedure.*

Text enhancement (2)

Aligning terminology for deactivated SCG:

[R2-2211790](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211790.zip) Corrections for DCCA further enhancements ZTE Corporation (Rapporteur), Sanechips CR Rel-17 37.340 17.2.0 0352 - F LTE\_NR\_DC\_enh2-Core

* Can be discussed if something needs to be merged to the rapporteur CR.

Capturing feature inter-operability in Stage-2:

[R2-2212690](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212690.zip) Discussion on remaining issues for conditional reconfiguration CATT discussion Rel-17 LTE\_NR\_DC\_enh2-Core

* Can be discussed if something needs to be merged to the rapporteur CR.
* [202]: Any changes to 36.300 and 38.300 are postponed.

### 6.2.2 Stage-3 corrections

Including essential corrections to CPAC, CHO + MR-DC, deactivated SCG and temporary RS for SCell activation..

Including discussion on whether the restriction on UE ignoring measID that have no CPC associated is a transitory issue or not.

Including discussion on how/whether anything is needed to solve the situation that, unlike Rel-17 UEs, Rel-16 UEs are required to perform conditional measurements regardless whether there is an associated conditional reconfiguration, and the Rel-17 network is not aware of this.

Online (1st Week Tuesday) (2+3)

Corrections to CPAC:

[R2-2212460](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212460.zip) Measurements for conditional reconfigurations Ericsson discussion Rel-17 LTE\_NR\_DC\_enh2-Core

*Observation 1 There would not be any functional errors in case a Rel-16 UE would be configured with conditional measurements without any associated conditional reconfiguration. The only issue would be that the UE would perform those measurements in vain.*

*Observation 2 The network can avoid configuring a rel-16 UE with conditional measurements with no associated conditional reconfiguration.*

*Proposal 1 RAN2 to capture in chair notes that a rel-17 the network can avoid configuring UEs supporting only CHO and/or rel-16 CPC with measurements not referred to by any execution condition.*

*Proposal 2 RAN2 to capture in chair notes that no functional errors are foreseen in case a rel-16 UE would be configured with conditional measurements without any associated conditional reconfiguration.*

* Noted

[R2-2211760](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211760.zip) Conditional measurement handling vivo discussion Rel-17 LTE\_NR\_DC\_enh2-Core

*Observation 1: There are below options regarding invalid conditional measurements:*

*- Option1: It is a transitory issue.*

*- Option2: It is not a transitory issue.*

*Option2-1: UE ignores invalid conditional measurements for SN-initiated inter-SN CPC case only.*

*Option2-2: UE ignores invalid conditional measurements for all kinds of conditional reconfiguration, i.e., CHO, CPA, intra-SN CPC, MN initiated inter-SN CPC, and SN initiated inter-SN CPC.*

*Observation 2: it’s unclear whether S-SN has to trigger the update of measurement configuration for CPC for the UE because of invalid conditional measurements.*

*Observation 3: There is no inter-operability impact if UE ignores invalid conditional measurements for all kinds of conditional reconfiguration.*

*Proposal 1: Conditional measurement unassociated with conditional reconfiguration is not a transitory issue.*

*Proposal 2: UE ignores conditional measurements unassociated with conditional reconfiguration for all kind of conditional reconfiguration, incl. CHO, CPA, intra-SN CPC, MN initiated inter-SN CPC, and SN initiated inter-SN CPC. No change on TS38.331 is required for this issue.*

* Noted

[R2-2211792](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211792.zip) Discussion on remaining issues for CPAC ZTE Corporation, Sanechips discussion Rel-17 LTE\_NR\_DC\_enh2-Core

[R2-2212882](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212882.zip) Measurement for conditional reconfiguration without referring the related condition Samsung Electronics Romania discussion

[R2-2212395](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212395.zip) Conditional measurements without conditional reconfiguration Huawei, HiSilicon discussion Rel-17 LTE\_NR\_DC\_enh2-Core

Online (Tuesday) (2)

Corrections to deactivated SCG:

[R2-2211965](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211965.zip) Various corrections on deactivated SCG Nokia, Nokia Shanghai Bell CR Rel-17 38.331 17.2.0 3663 - F LTE\_NR\_DC\_enh2-Core

- Huawei thinks we don’t always need descritptions for UL fields since UE behaviour is specified. Wonders why we add it here and not in MAC CE? Ericsson agrees with Huawei and thinks field description changes are not needed sinc they are already in Stage-2.

* Editorial changes 1 & 4 can be merged to the rapporteur CR.

[R2-2212854](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212854.zip) Calcification on SCG activation condition Google Inc. CR Rel-17 38.331 17.2.0 3744 - F LTE\_NR\_DC\_enh2-Core

- Chair thinks there is extra “UTRA” in the changes.

* Can discuss how to clarify there are two conditions in the same “if” text offline. If anything is agreeable, can be merged to the RRC rapporteur CR. Offline 202

Text enhancement (3)

Cleaning up unused conditions:

[R2-2212691](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212691.zip) Discussion on remaining issues for deactivated SCG CATT discussion Rel-17 LTE\_NR\_DC\_enh2-Core

* Can be discussed if something needs to be merged to the rapporteur CR.

Aligning terminology for deactivated SCG:

[R2-2211887](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211887.zip) feDCCA terminology alignment Samsung R&D Institute UK CR Rel-17 38.331 17.2.0 3655 - F LTE\_NR\_DC\_enh2-Core

* Can be discussed if something needs to be merged to the rapporteur CR.

[R2-2212925](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212925.zip) Calcification on (NG)EN-DC configurations Google Inc. CR Rel-17 38.331 17.2.0 3754 - F LTE\_NR\_DC\_CA\_enh-Core, LTE\_NR\_DC\_enh2-Core

* Can be discussed if something needs to be merged to the rapporteur CR.

Email discussions ([202])

* [AT120][202][DCCA] Finalizing CRs based on online agreements (Huawei/Google)

Scope: Finalize CR wordings according to online agreements.

Intended outcome: Agreeable CRs to 38.331 and 37.340.

Deadline: Deadline 1

## 6.3 Multi SIM

(LTE\_NR\_MUSIM-Core; leading WG: RAN2; REL-17; WID: RP-212610)

Tdoc Limitation: 2 tdocs

Rapporteurs may provide baseline correction CRs containing smaller corrections, text clarifications etc - please contact the Rapporteur before providing contributions on those aspects.

Including discussion on SA2 LS received in [R2-2209348](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209348.zip)

Online (Tuesday) (1+1)

SA2 LS on busy indication in RRC\_INACTIVE:

[R2-2211119](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211119.zip) Reply LS on NAS busy indication in RRC\_INACTIVE (S2-2207029; contact: Samsung) SA2 LS in Rel-17 MUSIM To:RAN2 Cc:CT1

* Noted

[R2-2211246](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211246.zip) Views on NAS busy indication in RRC\_INACTIVE Samsung Electronics Co., Ltd discussion Rel-17 LTE\_NR\_MUSIM-Core

*Observation 1: SA2 updated their specification to align with RAN2 on NAS busy indication in RRC\_INACTIVE i.e. see TS 23.501, clause 5.38.4.*

*Observation 2: CT1 updated their specification to align with RAN2 on NAS busy indication in RRC\_INACTIVE i.e. see TS 24.501, clause 5.3.1.4.*

*Proposal: Suggest to note* [*R2-2211119*](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211119.zip) *and confirm that no further action in RAN2 is required.*

* RAN2 confirms no further action is required for this topic

Online (Tuesday) (1)

UE assistance information and aperiodic MUSIM gaps:

[R2-2211357](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211357.zip) Discussion on the aperiodic MUSIM gap handling during handover Huawei, HiSilicon discussion Rel-17

*Proposal 1: RAN2 to confirm that the source gNB does not forward the aperiodic MUSIM gap to the target gNB during handover if the aperiodic MUSIM gap has been ended before the UE’s handover.*

*Proposal 2: Update the field description of UEAssistanceInformation in the handover preparation message as below:*

*ueAssistanceInformation*

*Includes for each UE assistance feature the information last reported by the UE* ***except for the preference of ended aperiodic MUSIM gap,*** *if any.*

- OPPO thinks target gNB can know when the gap ended anyway. Huawei thinks target gNB doesn’t know the H-SFN.

- Nokia thinks MUSIM source configuration can be used and we don’t need this. Huawei agrees UE can request new gap but tgNB doesn’t necessarily know if the gap ended. Nokia thinks the configuration tells this. Samsung agrees with Nokia. Ericsson agrees and thinks source node can just do this anyway. LGE agrees.

* RAN2 confirms that the source gNB may not forward the aperiodic MUSIM gap to the target gNB during handover if the aperiodic MUSIM gap has been ended before the UE’s handover. No specification change is needed.

Online (Tuesday) (1+1)

Can UE leaving RRC\_CONNECTED due to MUSIM interrupt re-establishment procedure?

[R2-2211770](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211770.zip) Finalizing re-establishment procedure handling while T346g is running Samsung Electronics Co., Ltd, Ericsson, ASUSTek, ZTE, Sanechips discussion Rel-17 LTE\_NR\_MUSIM-Core

*Observation 1: There seems no common understanding in RAN2 whether current specification mandates a UE to follow re-establishment procedures while timer T346g is running.*

*Observation 2: In RAN2#117-e meeting, RAN2 agreed that a UE behaves as in legacy i.e. detection of RLF and initiation of re-establishment is not dependent on the T346g running condition.*

*Observation 3: UE is NOT allowed to abort on-going re-establishment procedure by itself for any reason. Entering RRC\_IDLE state during re-establishment may only happen as a consequence of following re-establishment procedure as specified in TS 38.331.*

*Observation 4: Current procedure text does NOT allow a UE to stop running timer T346g during re-establishment procedure.*

*Observation 5: Leaving to UE implementation whether to stop running timer T346g during re-establishment may cause potential issues on network side i.e. RRC state mismatch problems or inability to identify whether to cease on-going re-establishment procedures due to T346g expiry.*

*Observation 6: Some companies claimed that it makes no sense for a UE to trigger re-establishment while T346g is running.*

* Observation: Current specification in TS 38.331 mandates a UE to follow re-establishment procedures while T346g is running, as in legacy.

*Proposal 2: Upon initiation of re-establishment procedure, the UE stops timer T346g, if running.*

*Proposal 3: RAN2 to add the following NOTE in clause 5.3.7.2 as follows:*

*NOTE: It is up to UE implementation whether to initiate the procedure while T346g is running.*

- QC agrees and thinks UE should be allowed to not do re-establishment. Huawei thinks normative text would be better than a NOTE. Apple thinks allowing UE flexibility is good and is fine with normative. MTK agrees.

- LGE is OK to allow UE to start re-establishment and leave it up to UE implementation. Slightly prefers NOTE. Thinks this is similar to legacy cases where NW discards UE context after a whole anyway if UE cannot re-establish.

- Vodafone thinks re-establishment should not be delayed. Is fine with NOTE. Nokia si fine with NOTE. OPPO is confused about this: UE should trigger re-establisment and adding even a NOTE changes beheaviour. vivo agrees and thinks this is against earlier agreements.

- MTK thinks there is no legacy UE behaviour for Rel-17.

* CB Thu: Whether we specify that UE is allowed to not initiated re-establishment or whether wo specification change is done. Offline 204 (Samsung) to discuss this and provide proposal how to continue.

[R2-2213314](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213314.zip) Summary of offline 204 on Re-establishment procedure handling while T346g is running Samsung report Rel-17 LTE\_NR\_MUSIM-Core

Observation: All companies are willing to accept to add the following NOTE in clause 5.3.7.2 as follows:

- NOTE: It is up to UE implementation whether to initiate the procedure while T346g is running.

Question: Do all companies are acceptable to specify that the UE does not initiate re-establishment procedure itself while T346g is running? If yes, which option (e.g. NOTE or normative text) is preferred?

- OPPO prefers NOTE without normative text. Samsung thinks this is not about preference but objections. QC thinks we have two options: If we specify UE behaviour, it’s normative, otherwise NOTE. LGE thinks normative would mandate UE behaviour.

[R2-2211771](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211771.zip) Correction on re-establishment procedure while T346g is running Samsung Electronics Co., Ltd, Ericsson, ASUSTeK, ZTE, Sanechips draftCR Rel-17 38.331 17.2.0 F LTE\_NR\_MUSIM-Core

* Add the following NOTE in clause 5.3.7.2: “NOTE: It is up to UE implementation whether to initiate the procedure while T346g is running.”
* Other parts in the draftCR are not agreed
* With the above changes, revised (to a real CR) in [R2-2213215](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213215.zip), which is agreed (unseen).

[R2-2213215](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213215.zip) Correction on re-establishment procedure while T346g is running Samsung Electronics Co., Ltd, Ericsson, ASUSTeK, ZTE, Sanechips CR Rel-17 38.331 17.2.0 XXXX - F LTE\_NR\_MUSIM-Core

* CR is agreed (unseen).

Online (Tuesday) (2)

Missing aperiodic gap settings text in procedural text:

[R2-2212111](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212111.zip) Clarifications on Aperiodic gap configuration Nokia Solutions & Networks (I) CR Rel-17 38.331 17.2.0 3671 - F LTE\_NR\_MUSIM-Core

- Samsung disagrees and thinks we don’t do this in legacy procedure either. Nokia thinks the ending point of the gap is missing. OPPO woners why we don’t have the same change for periodic gap? Apple has the same question. Huawei thinks the change is not needed.

* Not pursued

Does modifying existing periodic MUSIM gap parameters require release of the previous MUSIM gap?

[R2-2212746](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212746.zip) CR on the MUSIM Gap Configuration ZTE Corporation, Sanechips CR Rel-17 38.331 17.2.0 3731 - F LTE\_NR\_MUSIM-Core

- Samsung thinks the change is not correct since we have toRelease-List.

- Huawei thinks this can be handled by UE implementation. Apple is not sure whether we added similar normative text in other cases. UE implementation can handle this.

* RAN2 assumes UE handles this case according to the intent of the CR
* Not pursued (not needed)

Text enhancement (3)

Miscellaneous editorial corrections:

[R2-2211801](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211801.zip) Miscellaneous correction of NR RRC support for MUSIM vivo CR Rel-17 38.331 17.2.0 3642 - F LTE\_NR\_MUSIM-Core

[R2-2212745](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212745.zip) Miscellaneous Correction on MUSIM ZTE Corporation, Sanechips CR Rel-17 38.331 17.2.0 3730 - F LTE\_NR\_MUSIM-Core

*Using SA2/CT1 terminology of “paging indication” instead of “paging cause” in RAN2 specifications:*

[R2-2211356](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211356.zip) Aligning paging cause terminology between RAN2, CT1 and SA2 Huawei, HiSilicon discussion Rel-17

Not treated (nothing to be captured in RAN2 specifications) (1)

[R2-2212392](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212392.zip) On conflict of UE preferred RRC state report Ericsson discussion

## 6.8 RAN slicing

(NR\_Slice -Core; leading WG: RAN2; REL-17; WID: RP-212534)

Tdoc Limitation: 2 tdocs

Proposals that do not provide relevant Stage-3 details will not be treated.

Including further discussion on SA2 LS [R2-2209358](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209358.zip) and how to capture applicability of slice-based RACH in RRC states

Online (Tuesday) (2+2)

Discussion on SA2 LS [R2-2209358](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209358.zip) and how to capture applicability of slice-based RACH in RRC states:

[R2-2212251](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212251.zip) Slice Group considerations based on CT1/SA2 LSs Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_slice-Core

*Observation 1: In SA2/CT1 and RAN2 specifications it is not fully aligned how the slice group information is provided by the NAS to the AS layer for cell reselection.*

*Observation 2: There is no need to change the interface specifications of the UE due to the misalignment between SA2/CT1 and RAN2 specifications.*

*Observation 3: SA2 has specified how the UE derives the NSAG(s) and their priorities to be used for cell reselection and Random Access based on the NSAG information provided by AMF to the UE.*

*Proposal 1: Align the wording of the TS 38.300 and TS 38.304 with the SA2 and CT1 specifications in a way that clarifies that NAS provides the NSAG information that is used to derive the NSAGs and their priorities to be considered during cell reselection and slice specific Random Access. (See text proposals in Annex A.1 for TS 38.300 and Annex A.2 for TS 38.304.)*

- Huawei supports. Samsung agrees but has some proposals for the TP. CATT thinks we can reuse SA2 definitions in RAN2 specifcations.

* 1: Align the wording of the TS 38.300 and TS 38.304 with the SA2 and CT1 specifications in a way that clarifies that NAS provides the NSAG information that is used to derive the NSAGs and their priorities to be considered during cell reselection and slice specific Random Access. Can consider wording changes to the proposals in this contribution.

[R2-2212006](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212006.zip) Discussion on the LS from SA2 and CT1 and slice based RACH in RRC state CATT discussion Rel-17 NR\_slice-Core

* Focus on P1, P3

*Proposal 1: The AS layer should filter the NSAG Information used for slice based cell reselection based on the received NSAG Information and the S-NSSAIs in Allowed NSSAI or Request NSSAI from NAS.*

*Proposal 2: RAN 2 should align with the specs of SA2 and CT1 and adopt the CR for TS 38.304 in* [*R2-221007.*](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-221007..zip)

*Proposal 3: Support the slice based random access in RRC\_CONNECTED state and there is no spec impact.*

- Samsung thinks we already agreed not to do that.

* Noted (not done in Rel-17)

[R2-2212211](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212211.zip) Discussion on slice based random access Huawei, HiSilicon discussion Rel-17 NR\_slice-Core

* Focus on P1

*Observation 1: The introduction of NSAG priority for RA may influence the RA resources selection rule considering the combination of feature priority and NSAG priority.*

*• Opt#1: The UE NAS provides the UE AS with the associated NSAG IDs and their priorities. Then the UE AS performs RA resources selection based on feature priority and the NSAG ID which has the highest NSAG priority.*

*• Opt#2: The UE NAS provides the UE AS with the associated NSAG IDs and their priorities. Then the UE AS performs RA resources selection based on feature priority firstly when evaluating Slicing feature.*

*• Opt#3: The UE NAS provides the UE AS with the associated NSAG IDs and their priorities. Then the UE AS performs RA resources selection based on NSAG priority firstly when evaluating Slicing feature.*

*Proposal 1: RAN2 should discuss which option is preferred and its corresponding spec impacts.*

*Proposal 2: It is proposed that RAN2 agrees to change “NSAG-List-r17” in IE FeatureCombination into “NSAG-ID-List-r17” for alignment.*

- Samsung thinks option 1 is the right approach: UE considers feature priority, then NSAG information. LGE thinks NSAG is determined by upper layer, so first UE applies NSAG and then feature priority. MTK prefers option 1 since RRC decides on the priority and passes that to MAC.

- ZTE thinks MAC only expects one priority. Where do we write this?

- Apple wonders if option 1 means UE can consider both priorities together? Thinks we handle this in two steps: First feature priority and then NSAG. OPPO and QC agrees.

- Nokia thinks we didn’t discuss priorities for RACH, only reselection. This is only because CT1 provides some priorities now. Thinks option 1 is valid. Apple thinks RACH reousrce can support more than one features, so there can be different results depending on which option is chosen.

- ZTE worries we start to introduce intra-feature priority.

* Option 1 means RRC indicates the priority used for random access (MAC only considers one priority).
* RAN2 assumes option 1 is the correct interpretation in Rel-17.
* CB Thu: How to capture this in RRC specification. Offline 206 (LGE)

*• Opt#1: The UE NAS provides the UE AS with the associated NSAG IDs and their priorities. Then the UE AS performs RA resources selection based on feature priority and the NSAG ID which has the highest NSAG priority.*

[R2-2213293](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213293.zip) CR Rel-17 NR\_slice-Core

- LGE reports that most companies agree with this but two companies have additional issues with filtering NSAG according to SIB1 configuration.

- Nokia explains that NAS provides NSAG without differentiating them for RACH and cell reselection. So it is not clear if UE uses the groups for both cases or for only one. If group is listed in SIB1 for RACH it can be used for RACH prioritization. If the group is listed in SIB16, it can be used for slice-specific cell reselection. Thinks SA2 specs have some clarifications for this but it would be good to be clear in RAN2 as well.

- ZTE thinks in SIB1 we have the featurePriorities and reselection priorities are different. But NAS only provides one list of priorities, nothing to do with usage for RACH or reselection. We agreed there is one group and rest if left to UE implementation. Lenovo understands the comment from Ericsson and Nokia and is fine with that. Has also some editorials which was not taken into account. Vodafone thinks it’s important that NAS configures the NSAG, the radio configurations are done via AS. So network would also configure the NSAG over AS for RACH or reselection. Is fine to clarify how the radio works. CATT agrees with Nokia and thinks we can differentiate the use cases. Also thinks SA2 spec has a NOTE related to this so could add a NOTE that UE implementation determines only one priority is provided. Xiaomi agree with SIB1 filtering.

- Apple thinks there should be two sets of priorities from NAS. Nokia clarifies CT1 agreed to have only one set of priorities and AS decides how to use them. Thinks it can be up to operator to handle the configuration. Ericsson thinks AS should be able to distinguish the RACH and reselection.

- CMCC thinks that when UE triggers RACH based on multiple NSAG and for highest priority NSAG there are no RACH resources, what happens. Should not leave it up to UE implementation as operator cannot know what happens. Vodafone wonders what UE implementation should determine.

- Samsung thinks we could use Ericsson text I the LGE CR and we are done. LGE thinks we are only discussing text about SIB1. ZTE thinks we publish feature combinations and not only NSAG in SIB1, so there could be RAHC partition without NSAG. Huawei is OK with either CR. QC wonders if only lower priority has RACH resources, what will UE do? Ericsson thinks we have many issues with feature combinations and they are left to network implementation.

* NSAG that are used for RACH are given by SIB1 and NSAG that are used for cell reselection are given by SIB16. Capture in the CR that UE checks SIB1 for NSAGs to use for slice-specific RACH (e.g. as in Ericsson CR).
* 1-week post-meeting email discussion to capture the final RRC CR (LGE). Can also pinpoint (for the net meeting) if there are identified issues to consider further.

[R2-2212914](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212914.zip) Discussion on slice aware cell reselection LG Electronics discussion Rel-17 NR\_slice-Core

*Observation 1: Current 38.304 implicitly assumes that if NSAG is provided to AS, its NSAG priority is always provided for slice aware cell reselection/random access. It is unspecified for the case that NSAG is provided with no NSAG priority.*

*Observation 2: Current 38.304 only requires NSAGs and their priorities for slice aware cell reselection. Assuming that S-NSSAI is associated with a NSAG, AS specifications do not have to mention S-NASSI when selecting resources (frequency for cell reselection and RACH resources for RA).*

*Observation 3: if UE performs slice aware reselection upon triggering access with requested S-NSSAI, it delays RRC connection since UE has to reselect and read SIB in a new cell and then make an RRC connection, which is against the objective of slice aware operations.*

*Proposal: TS 38.304 specification relies on NSAGs and their priorities for slice aware cell reselection and random access, i.e., there is no need to mention S-NSSAI (allowed or request S-NSSAIs)*

Online (Tuesday) (5)

Clarification CRs to 38.304 and 38.331 related to above:

[R2-2212696](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212696.zip) Correction on handling of the NSAG information in cell reselection ZTE Corporation, Sanechips, Samsung CR Rel-17 38.304 17.2.0 0312 - F NR\_slice-Core

[R2-2212007](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212007.zip) Correction on TS 38 304 to align with SA2 and CT1 progress CATT CR Rel-17 38.304 17.2.0 0304 - F NR\_slice-Core

[R2-2212153](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212153.zip) Slice-based random access Ericsson CR Rel-17 38.331 17.2.0 3679 - F NR\_slice-Core

[R2-2212785](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212785.zip) Clarification on the detemination of NSAG for slice-based RACH LG Electronics Inc. CR Rel-17 38.331 17.2.0 3736 - F NR\_slice-Core

[R2-2211963](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211963.zip) Clarification on the slice information for random access OPPO CR Rel-17 38.331 17.2.0 3662 - F NR\_slice-Core

Online (Tuesday) (2)

SIB16 and slice-specific reselection priorities (postponed in RAN2#119e):

[R2-2212568](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212568.zip) Relationship between SIB16 and dedicated signalling Kyocera discussion

*Observation 1 For slice specific cell reselection, the main difference between SIB16 and RRCRelease is the availability of sliceCellListNR in SIB16 and its absence in RRCRelease.*

*Proposal 1 The UE should use the DL carrier frequency, the nsag-IdenityInfo, the nsag-CellReslectionPriority, and the nsag-CellRelsectionSubPriority, configured in RRC Release when their values are different between SIB16 and RRC Release.*

*Proposal 2 The UE should use sliceCellListNR from SIB16 when the slice information is configured in RRC Release.*

*Proposal 3 No need to change the specification in terms of the situation that the slice information is different between SIB16 and dedicated signalling.*

*Proposal 4 The relationship between SIB16 and RRC Release should be independent, i.e., the gNB may provide the configuration in RRC Release which is different from one in SIB16.*

- Samsung thinks P1-2 mean there can be differences between dedicated and SIB. Has similar proposals in their contribution and we need to clarify what is possible. In legacy we only consider frequencies different to SIB in RRCRelease. Thinks SIB16 is more relevant than dedicated. Nokia agrees with the Tdoc and disagrees with Samsung. Release information cabn contain mor e because it’s UE-specific and has less size restrictions.

- QC thinks mixing and matching creates trouble for UE. Should be enough to follow RRCRelease.

- Huawei is fine with P1-2 but for P4 there could be specification impacts. Does not want to discuss network implementation. Vodafone also thinks UE should follow RRCRelease as in legacy. Wonders if the slice information and priority is used for a purpose, and how much difference there would be in the end.

* UE follows RRCRelease information when provided.
* 3 No need to change the specification in terms of the situation that the slice information is different between SIB16 and dedicated signalling.

[R2-2212316](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212316.zip) Discussion on postponed issue for slice specific cell reselection Samsung R&D Institute India discussion

*Observation 1: A UE provided with slice based cell reselection priorities in RRCRelease uses the slice availability lists in SIB16.*

*Observation 2: A gNB sending RRC Release may not be aware of the cells other than its neighbor cells.*

*Observation 3: Normally, a UE can move to cells which are not the neighbors of the cell that send RRC Release while dedicated slice priority is valid.*

*Proposal 1: When the NSAG-Frequency pair configured in dedicated slice information is not available in the SIB16, consider the below options*

*a. UE doesn’t use the NSAG-Frequency pair for deriving slice based cell reselection priority in this cell.*

*b. UE derives the slice based cell reselection priority assuming all the cells in the frequency support the NSAG.*

*Proposal 2: RAN2 is requested to select option a) and adapt the given TP, when the NSAG-Frequency pair configured in dedicated slice information is not available in the SIB16.*

- Apple thinks that if SIB doesn’t have the frequency in dedicated signalling, UE does not need to consider that frequency. Thinks option a is the correct option. Nokia agrees on the lack of frequency, but thinks option B is about NSAG usage and can also be correct. CATT also agrees with option a. QC agrees with Nokia.

*Proposal 1: When the NSAG-Frequency pair configured in dedicated slice information is not available in the SIB16, consider the below options*

*a. UE doesn’t use the NSAG-Frequency pair for deriving slice based cell reselection priority in this cell.*

*b. UE derives the slice based cell reselection priority assuming all the cells in the frequency support the NSAG.*

* RAN2 common understanding is that option A in P1 is the correct interpretation.

Online (Tuesday) (2)

Corrections to slice-based cell reselection:

[R2-2211962](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211962.zip) Clarification on the slice information for cell reselection OPPO CR Rel-17 38.304 17.2.0 0302 - F NR\_slice-Core

- Nokia thinks this is related to the earlier proposals but disagrees with the last change in 5.2.5. Samsung thinks they and ZTE have also similar proposals.

- Ericsson thinks we should focus on AS and not NAS, and consider what we need to have to make UE implementation options clear. Should focus on allowed and requested NSSAI.

- LGE would like a focused email discussion. Thinks the addition of “associated with network slices” in 5.2.4.11 is not needed since the context is already clear.

- Samsung agrees with LGE.

- CATT thinks we need to make the limitations clearer as they proposed. Samsun gthinks AS doesn’t care about allowed or requested NSSAI, just NSSAI is enough. Ericsson thinks we should not couple AS and NAS so tightly and be clear.

- ZTE wonders if removing association is not needed? Samsung clarifies that with or without the change the meaning is the same. QC is concerned that UE might trigger reselection at connection setup. LGE agrees.

* The addition on “Frequencies that support at least one prioritized NSAG associated with network slice(s) received from NAS” is not agreed (from several places in the same clause)
* Add text to clarify what NSSAI means in the context of NSAG to avoid mentioning requested/allowed NSSAI.
* 1-week post-meeting email discussion to come up with agreed 38.304 CR (OPPO). Should consider all changes in 38.304 CRs in this meeting. If no consensus some aspects may be postponed or not pursued.

[R2-2212152](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212152.zip) AS-NAS for Slice-based cell re-selection Ericsson CR Rel-17 38.304 17.2.0 0305 - F NR\_slice-Core

- Ericsson would like to discuss whether it’s sensible to prioritize slice with user plane connectivity. Nokia thinks this is an addition and contradictory to what SA2 has agreed. CMCC thinks this was not discussed during WI phase so it’s a new feature.

* Not agreed (too late)

Online (Tuesday) (2)

HSDN and slice-based cell reselection:

[R2-2212210](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212210.zip) Discussion on slice based cell reselection Huawei, HiSilicon discussion Rel-17 NR\_slice-Core

* Focus on P2

*Observation 1: The UE NAS only needs to transparently provide the UE AS with NSAG information received from the CN and the Allowed NSSAI or Requested NSSAI. Then the UE AS is responsible for tailoring the appropriated NSAG information as input for slice based cell reselection.*

*Proposal 1: RAN2 should align with the progress of SA2/CT1 for the interaction between the UE NAS and the UE AS.*

*Proposal 2: If the HSDN-capable UE is in High-mobility state, the HSDN cell shall be always considered as the highest priority as specified in TS 38.304. No spec impacts are observed.*

* Topic is handled in main session

Text enhancement (1)

[R2-2211186](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211186.zip) Clarification on the applicability of slice-based RACH in RRC states Samsung Electronics Co., Ltd draftCR Rel-17 38.300 17.2.0 F NR\_slice-Core

TBD - Email discussions ([203])

* [AT120][203][Slicing] ()

Scope: Finalize CR wordings according to online agreements.

Intended outcome: Agreeable CRs to 38.331 in [R2-220xxxx](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-220xxxx.zip) and 38.304 in [R2-220xxxx](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-220xxxx.zip).

Deadline: Deadline 1

## 6.14 NR QoE

(NR\_QoE-Core; leading WG: RAN3; REL-17; WID: RP-211406)

Tdoc Limitation: 1 tdoc

Rapporteurs may provide baseline correction CRs containing smaller corrections, text clarifications etc - please contact the Rapporteur before providing contributions on those aspects.

Including disucssion on SA4 LS [R2-2209362](C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_120\\R2-2209362.zip)

Online (Tuesday) (2)

Reply LS from SA4 on buffer level measurement: Is a new configuration parameter needed for RvQoE buffer level measurement internal or is it determined implicitly according to reporting period?

[R2-2211121](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211121.zip) Reply LS on questions on RAN visible QoE (S4-221129; contact: Huawei) SA4 LS in Rel-17 NR\_QoE-Core To:RAN2, RAN3

* Noted (discussed together with contributions)

Reply LS from RAN3 on buffer level measurement: Measurement internal is determined by reporting interval, and PDU session ID is conditionally mandatory in signalling:

[R2-2211165](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211165.zip) Reply LS on questions on RAN visible QoE (R3-226061; contact: Huawei) RAN3 LS in Rel-17 NR\_QoE-Core To:RAN2, SA4

- Lenovo thinks RAN3 is only considering the case where UE is provided with explicit reporting interval. What happens is the interval is not provided? Huawei thinks RAN3 is still working on some aspects but considers we should use the same rule in all cases (i.e. derive based on available periodicity). Lenovo thinks explicit signalling would be more futureproof.

* Noted (discussed together with contributions)

Online (Tuesday) (3)

[R2-2212218](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212218.zip) Discussion on buffer level measurements based on SA4 and RAN3 reply LSes Huawei, HiSilicon discussion Rel-17 NR\_QoE-Core

*Observation 1: PDU session ID handling for RVQoE as specified in TS 38.331 is already aligned with the intention from RAN3 and no specifications changes are needed.*

*Proposal 1: Clarify in TS 38.331 that buffer level measurement interval for RAN visible QoE is derived based on the RAN visible QoE reporting periodicity and the number of configured buffer level measurement entries.*

- Huawei thinks this is not related to the third question. Ericsson thinks the Rel-18 parts could necessitate configuration. Samsung thinks we can follow RAN3 preference. We can also introduce the interval in Rel-18. Huawei clarifies the Lenovo concerns can be clarified in RRC field description (to cover explicit and container-based periodicity).

* 1: Clarify in TS 38.331 that buffer level measurement interval for RAN visible QoE is derived based on the RAN visible QoE reporting periodicity and the number of configured buffer level measurement entries.

CB (Friday) (1)

* Huawei comments that we should send LS to SA4 (RAN3 in CC) and has provided LS draft in 3223. SA4 needs to know since this impacts their specifications.
* Lenovo is fine to send LS to SA4 can do their work in the next meeting based on RAN2 and RAN3 LSs. Could add agreed CR in attachment.

[R2-2213223](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213223.zip) LS to SA4 LS Out NR\_QoE-Core

* Attached the agreed RRC CR and indicate this in the text
* With the above changes, the LS out is agreed in R2-2213228

[R2-2212464](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212464.zip) Discussion on reply LS on RAN visible QoE Ericsson discussion Rel-17 NR\_QoE-Core

*Proposal 1 Add a configuration parameter for buffer level measurement interval in RRC.*

*Proposal 2 Update the field description for PDU session ID and state that the UE shall always include the PDU session ID when received from upper layers.*

- Huawei thinks thi is already in procedural text. Samsung agrees. Apple thinks we have “if any” in procedural text so that is sufficient.

* The intent of P2 is agreed, but RAN2 considers the existing procedural text already covers it and no CR is needed for that.

[R2-2212463](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212463.zip) Correction CR for QoE measurements Ericsson CR Rel-17 38.331 17.2.0 3703 - F NR\_QoE-Core

*Clarification in the field description for PDU-Session-ID, that the UE always includes it in the RVQoE report when it has been received from upper layers.*

Online (Tuesday) (1)

Clarifying in RRC that SRB4 has lower priority than other SRBs and cannot be split:

[R2-2211547](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211547.zip) Discussion on remaining issues for NR QoE Lenovo discussion Rel-17 NR\_QoE-Core

*Proposal: RAN2 to agree on the clarifications on SRB4 with regards to its priority and non-support of split SRB.*

- Ericsson thinks it’s up to network to configure LCH priority so we don’t need to capture anything. Samsung thinks it would be good to capture. Nokia agrees. Lenovo thinks we always considered SRB4 has lower priority than at least SRB1, and then also SRB2.

- Vodafone wonders if we have similar statements for other SRBs? If we have, then this is fine but if not, it’s not. Lenovo thinks for MR-DC we captured SRB3 and split SRB priorities. Intel thinks we have defaults for SRBs.

* SRB4 has lower priority than at least SRB1.
* SRB4 does not support split bearer.
* Clarify the above in RRC (offline 207, Ericsson).

CB (Friday) (1)

[R2-2213218](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213218.zip) Correction CR for QoE measurements in NR Ericsson CR Rel-17 38.331 17.2.0 3703 1 F NR\_QoE-Core

* Add mention about the change on forbidding QoE with NR-U
* With the above changes, the CR is agreed (unseen) in R2-2213227

Text enhancement (2)

Explicitly forbidding QoE measurements with NR-U (as per RAN2#119e decision to not support NR-U+QoE in Rel-17):

[R2-2212217](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212217.zip) Correction to the combination of NR-U and QoE configuration Huawei, HiSilicon CR Rel-17 38.331 17.2.0 3685 - F NR\_QoE-Core

Clarifying that UE need not know about RAN overload when pausing of QoE reporting:

[R2-2211712](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211712.zip) Clarification of UE Behaviour upon Pause of QoE Reporting Apple, Ericsson, MediaTek, Huawei, HiSilicon CR Rel-17 38.300 17.2.0 0579 - F NR\_QoE-Core

## 6.20 Extending NR operation to 71GHz

(NR\_ext\_to\_71GHz-Core; leading WG: RAN1; REL-17; WID: RP-212637)

Tdoc Limitation: 1 tdoc

Rapporteurs may provide baseline correction CRs containing smaller corrections, text clarifications etc - please contact the Rapporteur before providing contributions on those aspects.

### 6.20.0 In-Principle Agreed CRs

Email approval (Thursday) (1)

[R2-2211367](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211367.zip) CP corrections for NR operation to 71GHz ZTE Corporation (rapporteur) CR Rel-17 38.331 17.2.0 3499 2 F NR\_ext\_to\_71GHz-Core [R2-2211055](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211055.zip)

* Endorsed (other changes agreed online can be merged with this CR)
* Combined all online agreements into revised version of RRC CR (Ericsson, offline 205)

[R2-2213258](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213258.zip) CP corrections for NR operation to 71GHz ZTE Corporation (rapporteur) CR Rel-17 38.331 17.2.0 3499 3 F NR\_ext\_to\_71GHz-Core [R2-2211055](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211055.zip)

* Use standard wording in cover page: “This CR is mandatory to implement for UEs and networks supporting feature X”.
* Add that UE receiving extended Rel-17 list shall ignore the signalled Rel-16 list (as in the ZTE CR)
* With the above changes, the CR is agreed (unseen) in [R2-2213216](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213216.zip)

### 6.20.1 Stage-2 and Stage-3 corrections

Including discussion on CCA for neighbour cell measurements in Rel-17 based on RAN4 LS R4-2217193

Online (Tuesday) (2+2)

TCI state usage for FR2-2 RSSI measurements:

[R2-2211148](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211148.zip) Reply LS on TCI assumption for RSSI measurement for FR2-2 (R1-2210590; contact: Apple) RAN1 LS in Rel-17 NR\_ext\_to\_71GHz-Core To:RAN4, RAN2

[R2-2211705](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211705.zip) Clarification on the TCI assumption for RSSI measurement for FR2-2 Apple CR Rel-17 38.331 17.2.0 3633 - F NR\_ext\_to\_71GHz-Core

- Ericsson thinks we concluded last time no specification change is needed. Thinks this can be in RAN1/4 specifcations. Apple thinks TCI stae configuration needs to be in RAN2 specification. LGE agrees and thinks this is necessary. ZTE also agrees but thinks we can massage the wording. Ericsson thinks we should remove “network should”. QC agrees with the intention. vivo also agrees and thinks Samsung CR is better. Apple thinks the field description clarifications are needed. ZTE agrees.

[R2-2212645](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212645.zip) Clarification on the reference serving cell for the TCI state Samsung draftCR Rel-17 38.331 17.2.0 NR\_ext\_to\_71GHz

[R2-2212757](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212757.zip) Correction on TCI assumption for RSSI measurement for FR2-2 LG Electronics Inc. CR Rel-17 38.331 17.2.0 3734 - F NR\_ext\_to\_71GHz-Core

* Combined content from all above CRs (including field description clarifications to all cases) and provide a new CR content offline (offline 205, Apple). Intent is not to combined this to the IPA CR.

[R2-2212995](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212995.zip) Clarification on the TCI assumption for RSSI measurement for FR2-2 Apple Inc, Samsung, LG Electronics CR Rel-17 38.331 17.2.0 3633 1 F NR\_ext\_to\_71GHz-Core

- Huawei thinks this is overlapping with Ericsson CR on 5.5.2. QC thinks we should use “for operation with shared spectrum access”

* Replace “shared spectrum channel access” with “for operation with shared spectrum channel access” in the modified field descriptions.
* With above changes, the CR is agreed (unseen) in [R2-2213217](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213217.zip)

Online (Tuesday) (1+2)

Extending RRC parameter range for multi-PDSCH scheduling:

[R2-2211149](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211149.zip) LS to RAN2 on RRC parameter impact for multi-PDSCH scheduling (R1-2210591; contact: LGE) RAN1 LS in Rel-17 NR\_ext\_to\_71GHz-Core To:RAN2

- Apple wonders about backward-compatibility. Do we need to dummify old field? Ericsson thinks the current version is not working. ZTE thinks that if we keep both IEs, NW can still use the old IEs when it configures lower number. UE has to support both.

* Dummify the old field and introduce a new field. UEs implementing this feature shall always support this field (clarify this in cover page).

[R2-2211533](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211533.zip) CP corrections for NR operation to 71GHz ZTE Corporation, Sanechips CR Rel-17 38.331 17.2.0 3609 - F NR\_ext\_to\_71GHz-Core

* 1. In ConfiguredGrantConfig, the number harq-ProcID-Offset is extended to 32
* 2. The maximum value of cg-nrofSlots for Rel-17 is extended to 320

- ZTE explains some configuration for HARQ process was missed. Also extending that requires extending *cg-NumberOfSlots*. Also includes some editorials.

- Apple agrees these need to be corrected but there is the NBC aspects.

* UEs implementing this feature shall always support this field (clarify this in cover page).

[R2-2212481](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212481.zip) Discussion on RRC issues for Ext71GHz Huawei, HiSilicon discussion Rel-17 NR\_ext\_to\_71GHz-Core

* 2: Clarify how to release the extended IE SlotFormatIndicator. Add the field description for *co-DurationsPerCellToReleaseList*.

Online (Tuesday) (3)

LS replies CCA information for neighbour cells (already discussed in RAN2#119e):

[R2-2211158](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211158.zip) Reply LS on CCA configurations of neighbour cells (R3-226000; contact: Huawei) RAN3 LS in Rel-17 NR\_ext\_to\_71GHz-Core To:RAN2 Cc:RAN4

*RAN3 would like to thank RAN2 for their LS on CCA configurations of neighbor cells.*

*Regarding the two options for obtaining CCA information of neighbor cells, RAN3 has no consensus which option will be pursued, and will not support exchange of CCA information between gNBs via network interface signaling in Rel-17. RAN3 may consider the interface signaling option in Rel-18.*

* Noted

[R2-2211170](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211170.zip) Reply LS on signalling of CCA configurations of neighbour cells (R4-2217193; contact: Nokia) RAN4 LS in Rel-17 NR\_ext\_to\_71GHz-Core To:RAN2 Cc:RAN1

*RAN4 would like to thank RAN2 for their LS response on CCA configuration of neighbour cells, confirming the feasibility of the indication whether to consider CCA for neighbour cell measurements in Rel-17.*

*RAN4 has concluded that such indication shall be available at the UE, so that it can apply the correct set of measurement requirements.*

* Noted

[R2-2211941](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211941.zip) FR2-2 and CCA configuration Nokia, Nokia Shanghai Bell CR Rel-17 38.331 17.2.0 3276 4 F NR\_ext\_to\_71GHz-Core [R2-2209234](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209234.zip)

* CR is agreed

Online (Tuesday) (2)

*Correcting SPS periodicity multiplier:*

[R2-2211991](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211991.zip) Clarification on periodicityExt in SPS config NTT DOCOMO, INC. CR Rel-17 38.331 17.2.0 3665 - F NR\_ext\_to\_71GHz-Core

* Can be merged to the RRC rapporteur CR [R2-2211367](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211367.zip)

Miscellaneous corrections:

[R2-2211505](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211505.zip) Rapporteur CR to 38.331 for 71 GHz Ericsson CR Rel-17 38.331 17.2.0 3606 - F NR\_ext\_to\_71GHz-Core

*1. Add the following texts in clause 5.5.2.10a*

*“If configured, the UE performs RSSI measurements according to the TCI state configured by tci-StateId in the reference BWP configured by ref-BWPId in the reference serving cell configured by ref-ServCellId (see TS 38.133 [14], clause 9.2A.7 and clause 9.3A.8).”*

- Apple thinks if inter-frequency RRSI measurement without TCI state is given, it’s up to UE implementation. Ericsson agrees and thinks we can include the “up to UE implementation”.

* Can consider this change (rewording is possible, including “up to UE implementation” aspects of TCI state as per RAN1 LS)
* Merged to the RRC rapporteur CR [R2-2211367](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211367.zip)

[R2-2213224](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213224.zip) Rapporteur CR to 38.331 for 71 GHz Ericsson CR Rel-17 38.331 17.2.0 3606 3 F NR\_ext\_to\_71GHz-Core

* Corrects some ASN.1 typos
* CR is agreed (unseen)

Text enhancement (1)

*Editorial correction:*

[R2-2211358](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211358.zip) Correction on on channelAccessMode2 vivo Mobile Com. (Chongqing) CR Rel-17 38.331 17.2.0 3588 - F NR\_ext\_to\_71GHz-Core

* Can be considered in the RRC rapporteur CR [R2-2211367](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211367.zip)

*Withdrawn:*

[R2-2211560](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211560.zip) Miscellaneous corrections to RRC for Ext71GHz Huawei, HiSilicon CR Rel-17 38.331 17.2.0 3617 - F NR\_ext\_to\_71GHz-Core Withdrawn

# 7 Rel-17 EUTRA Work Items

## 7.1 Common

(NB\_IOTenh4\_LTE\_eMTC6-Core; leading WG: RAN1; REL-17; WID: RP-211340)

(UPIP\_EN-DC\_UE; leading WG: RAN3; REL-17; WID: RP‑213669)

(LTE TEI17)

Essential corrections to LTE Rel-17 topics not covered by other agenda items.

[R2-2211103](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211103.zip) LS on updated Rel-17 RAN1 UE features lists for LTE after RAN1#110 Thursday (R1-2207926; contact: NTT DOCOMO, AT&T) RAN1 LS in Rel-17 NB\_IOTenh4\_LTE\_eMTC6, LTE\_NBIOT\_eMTC\_NTN, LTE\_terr\_bcast\_bands\_part1, NR\_SL\_enh To:RAN2 Cc:RAN4

* Noted (considered based on contributions, WI rapporteurs should take these into account)

[R2-2211140](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211140.zip) LS on updated Rel-17 RAN1 UE features lists for NR after RAN1#110bis-e (R1-2210489; contact: NTT DoCoMo, AT&T) RAN1 LS in Rel-17 NR\_feMIMO, NR\_ext\_to\_71GHz, NR\_IIOT\_URLLC\_enh, NR\_NTN\_solutions, NR\_pos\_enh, NR\_redcap, NR\_UE\_pow\_sav\_enh, NR\_cov\_enh, NR\_IAB\_enh, NR\_SL\_enh, NR\_MBS, NR\_DSS, LTE\_NR\_DC\_enh2, NR\_DL1024QAM\_FR1, NR\_RF\_FR1\_enh, NR\_SmallData\_INACTIVE, TEI17, NR\_newRAT To:RAN2 Cc:RAN4

* Noted (considered based on contributions, WI rapporteurs should take these into account)

Online (Tuesday) (1)

Clarification that 16QAM for NPUSCH is per-band capability:

[R2-2212961](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212961.zip) Correction to npusch-16QAM-r17 Qualcomm Incorporated CR Rel-17 36.306 17.2.0 1865 - F NB\_IOTenh4\_LTE\_eMTC6-Core

- Lenovo thinks 306 description need not have RRC details as sch. QC agrees but thinks we have done this in other cases. Nokia thinks this shuld be in 4.3.5.1

* CR is agreed.

Online (Tuesday) (1)

Very old FFS in Stage-2 specification:

[R2-2211364](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211364.zip) Removal of FFS from LTE Relay description Nokia (rapporteur), Ericsson CR Rel-17 36.300 17.2.0 1374 - F TEI17, LTE\_Relay-Core

- QC wonders if we need magic sentence. Nokia agrees it could be used. LGE thinks no magic setnce is used for Stage-2.

* CR is agreed

Online (Tuesday) (1+1)

Missing Rel-17 codepoint in AS-release in HandoverPreparationInformation:

[R2-2211751](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211751.zip) Correction on ue-ConfigRelease Huawei, HiSilicon CR Rel-17 36.331 17.2.0 4889 - F TEI17

- Google is OK with this approach. QC agrees with this.

* CR is agreed.

[R2-2212790](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212790.zip) Add a new field for indicating access stratum release Google Inc. CR Rel-17 36.331 17.2.0 4880 1 F NB\_IOTenh4\_LTE\_eMTC6-Core, UPIP\_SEC\_LTE-RAN-Core [R2-2210704](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210704.zip)

Email discussions ([201])

* [AT120][201][LTE] Finalizing CRs (Samsung)

Scope: Provide agreeable CRs based on online discussion for selected topics.

Intended outcome: Agreeable CRs.

Deadline: Deadline 1

[R2-2211292](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211292.zip) Correction to npusch-16QAM-r17 Qualcomm Incorporated CR Rel-17 38.306 17.2.0 0826 - F NB\_IOTenh4\_LTE\_eMTC6-Core

* Withdrawn

# 8 Rel-18

## 8.5 XR Enhancements for NR

(FS\_NR\_XR\_enh; leading WG: RAN2; REL-18; WID: RP-220285)

Time budget: 2 TU

Tdoc Limitation: 7 Tdocs

### 8.5.1 Organizational

Including LSs and any rapporteur inputs (e.g. work plan, draft TR)

Online 1(Tuesday) (1)

Work plan:

[R2-2211595](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211595.zip) Work Plan for Rel-18 SI on XR Enhancements for NR Nokia, Qualcomm (Rapporteurs) Work Plan Rel-18 FS\_NR\_XR\_enh

- Ericsson: most promising solution should be solutions for which we have gains shown.

- Vodafone: if we extend the study it should be to conclude on issues we have identified, not to study new things.

Online 1(Tuesday) (1)

Update on SA2 work status:

[R2-2211596](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211596.zip) SA2 Status for XR Nokia, Qualcomm (Rapporteurs) discussion Rel-18 FS\_NR\_XR\_enh

*The following conclusions from the SA2 SI are of interest to the RAN:*

*- PDU Set QoS parameters (provided via control plane):*

*- PDU Set Error Rate (PSER);*

*- PDU Set Delay Budget (PSDB);*

*- PDU Set Integrated Indication (PSII) i.e. whether all PDUs are needed for the usage of PDU Set by application layer.*

*- PDU Set related assistance information (provided via control plane):*

*- PDU Set QoS parameters (see above);*

*- Burst periodicity.*

*- PDU Set information (provided by user plane and optionality of each information is FFS):*

*- PDU Set Identifier;*

*- Start PDU and End PDU of the PDU Set;*

*- PDU SN within a PDU Set;*

*- PDU Set Size;*

*- PDU Set Importance;*

*- End of Data Burst indication.*

*- RAN performs PDU Set based QoS handling based on received PDU Set QoS Parameters via control plane, and PDU Set Information received via user plane.*

*- Information provided to the RAN at PDU session establishment/modification:*

*- Periodicity for UL and DL traffic of the QoS Flow.*

*- In addition to integer periodicity values, non-integer values associated to, e.g., 45FPS, 60 FPS, 90FPS, 120FPS, shall be supported. Such information shall be exchanged by re-using/extending the TSCAI/TSCAC definitions in TS 23.501 clause 5.27.2.1*

*- Traffic jitter information associated with each periodicity.*

CATT & Intel: the burst periodicity should be provided per QoS flow

Huawei: dynamic part is not going to be provided by CN, text needs to be updated

Intel: we need to discuss the uplink

LGE: wonders which part of the information is provided with every PDU

Chairman: all user plane information is carried in GTP-header

Lenovo: Stage 3 details whether all will be carried in GTP-header (for instance whether PDU Set size is carried always is FFS).

Intel: would like to have references to conclusion section of the SA2 TR

* Check offline SA2 status
* Take into account when updating the TR after this meeting

Online 1(Tuesday) (1)

Latest draft TR:

[R2-2212908](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212908.zip) TR 38.835 v031 Nokia (Rapporteur) draft TR Rel-18 38.835 0.3.1 FS\_NR\_XR\_enh

* Agreed as baseline.

Online 1(Tuesday) (3)

[R2-2211138](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211138.zip) LS on XR and Media Services (S2-2209979; contact: vivo) SA2 LS in Rel-18 FS\_XRM, FS\_NR\_XR\_enh To:RAN1, RAN2, RAN3

*- In KI#3 (Network exposure), SA2 has been studying what information is useful for the purpose of enablement of rate adaptation at application and how that can be exposed by 5GS to the server and agreed the conclusions in TR 23.700-60 clause 8 (see pCR S2-2209977 and S2-2209978). The purpose of rate adaptation is to reduce the influx of data to keep the buffer/queue length level low which gives low latency.*

*Two variants of L4S marking are considered: (1) L4S marking in the NG-RAN node and (2) L4S marking by the PSA UPF based on information provided by NG-RAN. SA2 would like to ask RAN2 and RAN3 feedback on the following questions:*

* Q1: whether it is feasible for RAN to estimate congestion information per QoS flow, per DRB in downlink and uplink directions.*

* Q2: whether it is feasible for RAN to estimate congestion information per QoS flow in UL, per DRB in UL without UE impacts.*

Chairman: we could leave it up to RAN3 to answer

Vivo & Xiaomi: there are RAN2 specifics aspects to handle (DRB, UE impacts)

Vodafone: should be handled in RAN3 to avoid sending conflicting messages

ZTE: RAN3 can handle DL for sure, maybe RAN2 could focus in RAN2.

Intel: We should discuss both.

[R2-2211490](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211490.zip) Reply LS to SA2 on XR vivo LS out Rel-18 FS\_NR\_XR\_enh To:SA2 Cc:RAN1, RAN4

[R2-2212189](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212189.zip) Discussion on network exposure of congestion level of RAN node Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

*Observation: All the relevant element which may affect RAN congestion can be well perceived by the RAN node.*

*Proposal 1: Reply to SA2 that it is feasible for RAN to estimate congestion information per QoS flow and per DRB in downlink and uplink directions.*

*Proposal 2: Reply to SA2 that it is feasible for RAN to estimate congestion information per QoS flow and per DRB in uplink without UE impacts.*

Qualcomm: we need to understand what congestion means.

Vivo: we agree with Qualcomm. We believe it’s related to latency.

Huawei & Vodafone: well-defined concept.

Vodafone: what matters is how latency requirement is met, there are many tools for that.

Ericsson & Nokia: agree that we have enough mechanisms.

* Vivo and Huawei to reply to SA2 that we have enough tools available to assess congestion.
* [AT120][299][XR] Reply LS to SA2 on Congestion (Huawei, Vivo)

Scope: reply to SA2 that RAN2 has enough tools available to assess congestion.

Intended outcome: LS in [R2-2212989](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212989.zip) (updated of [R2-2211490](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211490.zip))

Deadline: Deadline Thursday 17th.

CB (Friday) (1)

[R2-2212989](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212989.zip) Draft Reply LS to SA2 on XR vivo LS out Rel-18 FS\_NR\_XR\_enh To:SA2 Cc:RAN1, RAN4

- vivo reports that adding “e.g. traffic latency” is contentious.

- Vodafone thinks that RAN3 already added this information. Intel indicates that we can reply even if RAN3 has sent the response. Suggests removing the parenthesis.

* Remove “(e.g. traffic latency)” from the reply sentences
* Use “RAN2” as sender and removal of “Draft” from title
* With above changes, the LS is approved in [R2-2213226](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213226.zip)

SI status (Thursday) (1)

- Nokia thinks the SI is not yet ready to close. TR does not have very much content and SA2 and SA4 have extended their work. We still shouldn’t push WI completion forward. Continuing SI would help to have more focused WI content. QC has no strong view and thinks there will be a WI for XR. Agrees release completion would not change. Lot of things depends on SA2/4 but options are well-known.

- Huawei agrees there’s a lot of work to do but is not sure keeping SI open is good since the scope is very broad. LGE thinks it’s premature to have a WI. We have not much progress so better keep SI open. Vodafone thinks we have too many open points to create a reasonable WI now, but also extending SI by 3 motnhs should have a clear scope. Should identify the areas to study further. Ericsson agrees with Huawei. Discussions would be very similar anyway. Thinks we should be clear on what is done if SI is extended. BT agrees with Vodafone: We need to focus. vivo thinks the current discussion is enough to generate WI scope. Thinks we need to limit scope if we extend the SI. Nokia agrees with Ericsson. Thinks we need well-scoped WIs and take SA2/4 decisions into account. Huawei thinks we need to narrow down the scope. Nokia thinks power saving and capacity enhancements can only be considered in WI phase if we extend the SI. ZTE thinks the decision is done in RAN but we can express RAN2 view. Thinks RAN1 recommendation is also important as RAN1 may not have enough time for their work. Has slight preference for moving to WI phase despite RAN2 progress. Vodafone thinks XR awareness and PDU set handling are main open issues. Nokia agrees the RAN1 part is RAN issue. We need to decide what to do with the TR. Apple thinks it’s better to keep the SI open for a while longer. Intel thinks we need to continue the SI and send the LSs to SA2/4. Agrees power saving and capacity are more stable and RAN1 could start WI while RAN2 continues SI. vivo thinks we shouldn’t mi WI in RAN1 and SI in RAN2 as that can create problems. CATT thinks we progressed on issues where we need feedback from SA2/SA4. The key issue is the mapping options from SA2 for QoS flows. OPPO thinks we can discuss this in RAN meeting. Can also start staggered WI or study phases. Ericsson has strong concerns on extending RAN1 part. If we continue RAN2 study we should focus on those that have RAN2 impact. Sony wonders if we can say it would be beneficial, shouldn’t it rather be essential. Vodafone thinks we could say other objectives than awareness are completed. Huawei agrees we need further discussion but is not sure we need SI for that. Nokia thinks we just state facts and let RAN decide what to do.

* Majority of companies in RAN2 thinks the objective on XR awareness is not complete because of SA2 progress. Further discussion on how to handle RAN2 impacts of SA2 and SA4 decisions would be necessary (e.g. PDU set handling in AS).
* RAN2 thinks the objectives on power saving and capacity enhancement are completed.
* RAN2 intends to send the TR to RAN for information

### 8.5.2 XR-awareness

No documents should be submitted to 8.5.2. Please submit to 8.5.2.x

Contributions should take the existing SA2/SA4 decisions into account.

#### 8.5.2.1 PDU sets and data bursts

Including discussion on how PDU sets can be mapped to DRBs and how the LCH configuration works.

Including discussion on “traffic flow without PDU set” and how does that fit in with XR traffic awareness (e.g. is it only pose control)?

Online 1(Tuesday) (3-4)

[R2-2212471](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212471.zip) Discussion on PDU sets and data bursts InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P5

*Awareness of PDU set characteristics*

*Proposal 1: Support awareness of PDU set types (e.g., type 1 or type 2) at UE and RAN.*

*Proposal 2: Support awareness of importance of PDU sets at UE and RAN.*

*Mapping of PDU sets to DRBs*

*Proposal 3: SDAP maps PDU sets to one or multiple DRBs based on new mapping rules (e.g., based on importance of PDU sets).*

*Proposal 4: DRBs are configured for meeting PDU-set-level QoS (e.g., PSDB, PSER).*

*LCH options for handling PDU sets*

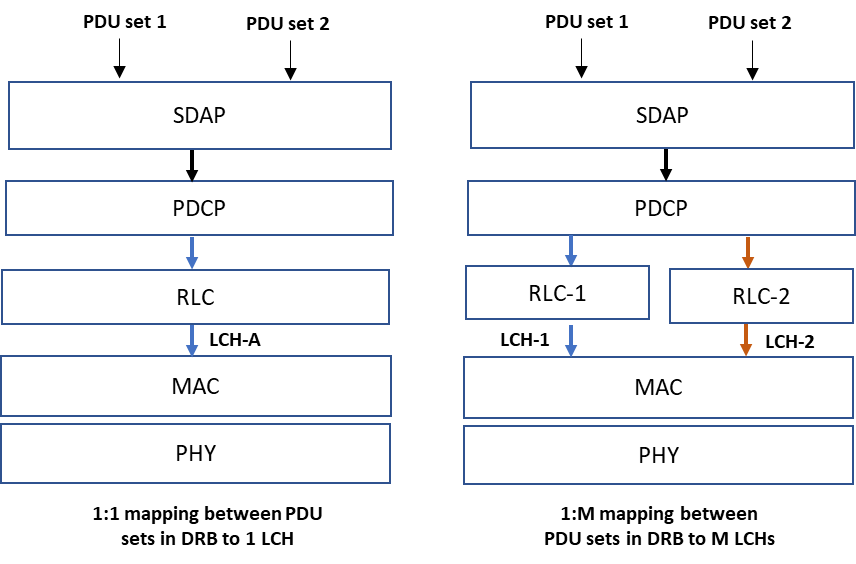
*Observation 1: Depending on how PDU sets are mapped to QoS flows at the higher layers and the respective PDU set-level QoS, different alternatives for the L2 structures can coexist at the AS layers.*

*Proposal 5: There are two options for mapping the PDU sets in DRBs to LCHs:*

* Option 1: 1-to-1 mapping (e.g., PDCP maps PDU sets to one LCH)*

* Option 2: 1-to-M mapping (e.g., PDCP maps PDU sets to M LCHs)*

*RAN2 supports both options 1 and 2.*



*Reordering and in-order delivery*

*Proposal 6: RAN2 to send LS to SA4/SA2 to clarify whether in-order delivery of PDU sets is needed during transmissions in DL and UL.*

Ericsson: disagree with the proposal, no gains shown. 111 is the only reasonable option.

Samsung: would like to have option 2.

Apple: this would be needed when several QoS flows are muxed on the same DRB.

ZTE: if we have many DRBs as QoS flows we can have 111, if more, not. In-order delivery also needs to be considered.

Chairman: technical reasons to have DRB limit of 16 would equally apply to any subchannels.

Ericsson: agree

CATT: apply should equally apply in DL & UL. In UL, subchannels would be difficult to handle in LCP (PBR setting). Video stream has a PBR of its own, not IPB frames separately.

Vivo: would like to map PDUs of PDU sets to different LCH

Vodafone: 111 is legacy so no question it works. Wonders how many PDU sets we will have.

Qualcomm: differentiated handling can only be handled with Option 2.

Huawei & Lenovo: we need differentiated handling. Reordering also needs to be handled.

Lenovo: we agree with Qualcomm.

Oppo: wonders how PDCP can route the PDU sets.

CATT: 111 still allows differentiated handling (for free in DL, with minor enhancements to LCP in UL).

Mediatek: seems that PSER was only given as reason but PSER is static so do not see a reason to change

Intel: re-ordering is main issue.

Google: PSER can be per importance.

* N1N excluded
* Splitting DRB into multiple LCH (DC like) FFS.
* Should try to understand why we would need to treat PDU sets differently over the radio and why different PDU sets are muxed over same flows. Also need to understand need for reordering.
* Send LS to SA2/SA4 (Nokia)
* [AT120][298][XR] LS to SA2 on PDU Set Handling (Nokia)

Scope: send an LS to SA2 to understand why we would need to treat PDU sets differently over the radio and why different PDU sets are muxed over same flows. Also need to understand need for reordering.

Intended outcome: LS in [R2-2212993](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212993.zip)

Deadline: Deadline Thursday 17th.

CB (Friday) (1)

[R2-2212993](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212993.zip) Draft LS on PDU Set Handling Nokia LS out Rel-18 FS\_XRM, FS\_NR\_XR\_enh To:SA2, SA4 Cc:-

- CATT is fine with LS except for “can be mapped”, which should be “could be mapped”.

- QC has one minor comment on “(for instance, to deal with PDU Sets with different importance, PSER, and/or PSDB within the same QoS flow).”, which seems to suggest that different PDU sets would always have different characteristics, which may not be the case.

- Intel is fine with the LS except for reordering where they would like to add “to upper layers” to make it clear what we mean.

- Apple would like to clarify what the QC comment means. There are cases where both could be possible, so should say that. Intel thinks this is already clear and thinks the key question is what characteristics can be different.

- Ericsson wonders if we have data of different priority/importance, how can we do in-sequence delivery? Nokia agrees this is a relevant question but we need to know what SA2/4 says first.

- Vodafone wonders if we need to ask about PDU set characteristics?

- LGE wonders about in-sequence delivery – is this only about option 111? If so, should say that. Nokia indicates they don’t need to know which cases this happens. We just need to know if it’s needed. Huawei agrees.

* Change “can be mapped” to “could be mapped”.
* Ask from SA2 whether different PDU sets may have different characteristics and if so, which characteristics can be different.
* Instead of “Reordering” Use title “In-sequence delivery to upper layers”
* Revised in [R2-2213225](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2213225.zip)

CB main session

[R2-2212534](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212534.zip) Discussion on PDU Set for XR-awareness NEC Corporation discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P1-5

*Observation 1: For supporting QoS handing of alternative N1N, SDAP shall support mapping a single QoS flow A to multiple DRBs.*

*Observation 2: With SA2 concluded PDU set related parameter/information provided by the CN, it is feasible to enhance SDAP layer to support mapping a single QoS flow A to multiple DRBs.*

*Proposal 1: RAN2 to assume the option 1 of DRB(s)/ LCH(s) mapping for alternatives NN1 and N11 to ensure PDU set based QoS handling.*

*Proposal 2: If Proposal 1 can be agreed, capture Figure 3 and Table 1 to TR38.835.*

*Proposal 3: RAN2 to agree to work further on alternative 111 (if SA2 agrees to introduce sub-Qos flow) and alternative N1N (with current QoS flow definition) during normative phase.*

*Proposal 4: RAN2 to discuss how the intra-PDU Set information is conveyed in the PDCP header.*

*Proposal 5: RAN2 not to discuss inter-PDU Set handling.*

*Proposal 6: During handover, PDU Set information can be considered to be forwarded from source gNB to target gNB.*



[R2-2211177](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211177.zip) Discussions on PDU Sets Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P1-5

*Mapping PDU Sets with different importance*

*Observation 1. The intention of supporting different PDU Set Importance levels is to enable differentiated handling for different types of PDU Sets.*

*Observation 2. A fundamental principle in the 5G QoS framework is that all user-plane traffic within a QoS flow should receive the same forwarding treatment.*

*L4S marking*

*Observation 3. As the purpose of L4S marking is to inform a XR application of QoS degradation in its network path, criteria used by RAN to estimate congestion can include at least delay, jitter and/or error rate cross Uu interface.*

*Observation 4. On DL, RAN is able to (approximately) estimate delay, jitter and error rate of PDUs per QoS flow in an AM DRB without UE impact. But not so for an UM DRB.*

*Observation 5. On UL, RAN is not able to estimate delay or jitter of a QoS flow or DRB without UE assistance. However, RAN is able to estimate error rate without any UE impact.*

*Delivery deadline vs delay budget*

*Observation 6. If RAN has the knowledge of delivery deadlines of downlink traffic or nominal arrival times of uplink traffic, it can have more delay budget in its scheduling and hence achieve higher system capacity and enable more UE power savings.*

*Observation 7. It is simpler to have UE than 5GC provide delivery deadlines and nominal arrival times to RAN.*

*Observation 8. Delivery deadlines can also simplify RAN’s handling of multi-modal traffic.*

*UL PDU Set*

*Proposal 1. UE identifies and marks UL PDU Sets by either UE implementation or matching RTP/SRTP header and payload (i.e. the same method used by UPF for DL PDU Sets).*

*Proposal 2. UE provides the following information on UL PDU Sets to RAN via user plane:*

*• PDU Set identifier (e.g. sequence number)*

*• Boundary indication of an UL PDU set (e.g. start and end of a PDU Set)*

*• (optional) PDU Set size in bytes or number of PDUs in PDU Set*

*• (optional) End of Data Burst indication in the header of the last PDU of a Data Burst*

*• FFS PDU Set Importance*

*Mapping PDU Sets with different importance*

*Proposal 3. UL PDU Sets with different importance are mapped to different QoS flows, which have separate QoS profiles to support differentiated handling of different importance.*

*Proposal 4. If in-order delivery is required, PDU Sets with different importance but associated with the same traffic flow can share the same sequence number space for PDU Sets and be mapped to the same DRB. Otherwise, how to map QoS flows and DRBs is up to network configuration (i.e. either Alternative 111 or Alternative NN1).*

*Proposal 5. Alternative N11 and Alternative N1N are not supported.*

*L4S marking*

*Proposal 6. Reply to SA2 with Observation 4 and 5.*

*Proposal 7. Whether/when/how UE performs ECN or L4S marking is up to UE implementation. No spec changes are needed.*

*Proposal 8. UE reporting congestion level to RAN for the purpose of ECN/L4S marking is not supported.*

*Signaling DL PDU Set Information*

*Proposal 9. DL PDU Set information is also signalled over Uu interface. It includes at least fields that help identify the association between a PDU and a PDU Set, e.g. sequence number, boundary indication, and (optional) size of a PDU Set, etc.*

*Proposal 10. PDU set information is sent in band in PDCP header of each PDU in a PDU set. It is not ciphered and not included in integrity protection.*

*Delivery deadline vs delay budget*

*Proposal 11. RAN uses delivery deadlines (for downlink) and nominal arrival times (for uplink) instead of configured deadlines (i.e. actual arrival time + a fixed delay budget) in its scheduling of PDUs and PDU sets.*

*Proposal 1. UE identifies and marks UL PDU Sets by either UE implementation or matching RTP/SRTP header and payload (i.e. the same method used by UPF for DL PDU Sets).*

LGE: Stage 3 details?

Xiaomi: agree with P1

Intel: can be left to SA2

Mediatek: marking of PDU sets should only be introduced if needed by gNB.

Huawei: wonders how the gNB would use the information?

Ericsson: BSR should be enough.

Nokia: PDU marking not needed.

CATT: agree with Mediatek.

Vodafone: would like to understand why need for identification then?

Chairman: to route the sets on the right LCH

Qualcomm: in-band marking needed for discard

HW: makes no difference once transmitted.

ZTE: some semi-static information would be useful to handle discard.

**For Uplink**

* Agree that UE identifies PDU Sets / Bursts.
* In-band marking not needed. Further information considered if BSR is not enough.
* Handling of discard FFS.
* Mention agreements in SA2 LS (see email discussion 298)

[R2-2211718](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211718.zip) PDU Set based QoS Apple discussion FS\_NR\_XR\_enh

* Focus on P3, P6

*Proposal 1: RAN2 should rely on the existing QoS model for as much as possible. A one to one mapping of PDU Sets to QoS flows to DRBs is the most preferred approach.*

*Proposal 2: When PDU Sets are mapped to the same DRB, PDU Set integrated packet handling and differentiated QoS treatment of PDU Sets can be achieved by mapping PDU Sets with different QoS characteristics to different logical channels / RLC entities.*

*Proposal 3: Types of PDU Sets associated with different QoS characteristics may be mapped to different DRBs. In-ordering delivery can be maintained in higher layers. When XR traffic flows require in-order delivery in AS, different types of PDU Sets may be mapped to the same DRB.*

*Proposal 4: The exact location (layer) of new packet headers can be defined based on SA2 progress.*

*Proposal 5: “Traffic flows not based on PDU Sets” should be characterized based on their contextual relation to other XR traffic flows and PDU Sets to be treated.*

*Proposal 6: “Traffic flows not based on PDU Sets” can be treated in two ways on a QoS flow, DRB or LCH:*

*a) In traditional per-packet fashion (when its PDUs are independent of other XR traffic flows); or*

*b) As PDU Set with “number of packets = 1” (when its PDUs are closely related to other XR traffic flows) e.g. to keep them in the framework for XR traffic.*

[R2-2212852](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212852.zip) Discussion on XR awareness and PDU Set LG Electronics Inc. discussion Rel-18 FS\_NR\_XR\_enh

*Observation 1. Alternative 111 (model 1a) may suffer from shortage of DRBs when the number of XR services increases.*

*Observation 2. Alternative N1N (model 2b) may require unnecessary duplicated functions at the SDAP entity which needs huge spec impact.*

*Observation 3. Alternative N1N (model 2b) may suffer from shortage of DRBs when the number of XR services increases, similar to Alternative 111 (model 1a).*

*Observation 4. Splitting PDUs to different RLC entities at PDCP is a feasible option to support QoS handling per PDU Set within a single DRB. The required change like enhancement for packet inspection seems acceptable.*

*Observation 5. Delivering PDUs to a single RLC entity at PDCP and performing QoS differentiation within the RLC entity is an option to support QoS handling per PDU Set within a single DRB. But, expected changes such as packet inspection in RLC and PDU delivery to multiple logical channels seem to have considerable spec. impact.*

*Proposal 1. Consider Alternative 111 (model 1a) as baseline, and allow other Alternatives to resolve DRB shortage problem.*

*Proposal 2. Alternative N1N (model 2b) is not supported.*

*Proposal 3. Whether to support Alternative NN1 (model 1b), or Alternative N11 (model 2a), or both is decided by SA2.*

*Proposal 4. If SA2 decides that different PDU Sets can be multiplexed onto a single DRB, RAN2 should consider QoS handling per type of PDU Set within a single DRB.*

*Proposal 5. Allow a PDCP entity to split PDUs to different RLC entities according to types of PDU sets for supporting QoS handling per PDU Set within a single DRB if Alternative NN1 (model 1b) or Alternative N11 (model 2a) is supported.*

[R2-2212188](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212188.zip) Further discussion on PDU set handling Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

*Mapping between DRBs and LCHs*

*Observation 1: For Model 1b and 2a, an additional effort is required to identify and specify a way to map PDU sets with different importance onto the separate LCHs.*

*Observation 2: For Model 2b, an additional effort is required to identify and specify a way to map PDU sets contained in a single QoS flow to different DRBs.*

*Observation 3: Model 1a has least impacts onto RAN2 protocol stack and is preferred provided that AS reordering is not required between data belonging to PDU sets mapped to different DRBs.*

*Handling of traffic flow without PDU set*

*Observation 4: The assistance information agreed by SA2 is not limited to traffic based on PDU sets, e.g. periodicity.*

*Mapping between DRBs and LCHs*

*Proposal 1: In order to enable differentiated PDU set handling at RAN, it should be possible to map PDU sets with different importance to different logical channels.*

*Proposal 2: Before selecting a protocol stack for handling PDU sets with different importance, RAN2 should check with SA2/SA4 whether AS reordering needs to be supported for XR traffic.*

*Proposal 3: If AS reordering is needed for an XR traffic, the legacy PDCP reordering function is reused, i.e. no new reordering function will be defined in other AS layers, e.g. SDAP.*

*Proposal 4: Alternative 1a is selected in case XR service does not require AS reordering.*

*Proposal 5: If single DRB is used, i.e. alternative 1b and 2a, PDCP layer shall be able to map PDU sets with different importance levels to different logical channels.*

*Proposal 6: The same RAN protocol design should be used to handle both DL and UL differentiated PDU set handling.*

*Proposal 7: It can be up to UE implementation how to identify the packets belonging to the same PDU set, as well as the importance information for each PDU set.*

*Handling of traffic flow without PDU set*

*Proposal 8: For non-PDU set based traffic flows, the assistance information agreed by SA2 (e.g. periodicity) should also be available and no special treatment is required.*

Question: delay in LCP?

Ericsson & ZTE: agree it’s not needed.

Lenovo: needed to ensure delay requirements are met.

CATT: not convinced this is needed and wonder how it would work with non-delay sensitive.

Mediatek: not convinced this is required.

Samsung: want to consider remaining delivery time.

* If delay-aware LCP is introduced, need the ability to turn it off.
* SRBs not impacted.
* Not considered further unless fundamental issues are identified.

[R2-2212329](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212329.zip) Discussion on PDU Sets and Data Bursts for XR Google Inc. discussion

[R2-2212704](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212704.zip) Considerations on PDU sets and Data bursts in RAN CMCC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211995](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211995.zip) Discussion on PDU sets mapping model NTT DOCOMO, INC. discussion Rel-18

[R2-2212608](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212608.zip) Discussion on Uplink XR-Awareness for XR services Meta USA discussion Rel-18

[R2-2211436](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211436.zip) XR awareness for PDU sets and bursts CATT discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212649](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212649.zip) Discussion on PDU set to DRB mapping Samsung discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212889](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212889.zip) Discussion on PDU Sets and Data Burst Ericsson discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211597](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211597.zip) Mapping of PDU Set, QoS Flow and DRB Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211437](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211437.zip) On the PDU set mapping options CATT discussion FS\_NR\_XR\_enh

[R2-2211524](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211524.zip) PDU set to DRB mapping for XR ZTE Corporation, Sanechips discussion

[R2-2211378](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211378.zip) DRB mapping for XR specific requirement Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211491](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211491.zip) Discussion on XR awareness and per-QoS flow/DRB congestion vivo discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211584](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211584.zip) Discussion on QoS support with PDU Set granularity Xiaomi Communications discussion

[R2-2211848](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211848.zip) Discussions on L2 structure of XR Fujitsu discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211957](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211957.zip) Discussion on PDU Set awareness OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212039](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212039.zip) Discussion on PDU sets and data burst awareness in RAN Lenovo discussion Rel-18

[R2-2212163](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212163.zip) Discussion on PDU sets and data bursts Spreadtrum Communications discussion Rel-18

[R2-2212695](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212695.zip) Discussion on PDU set mapping for XR-awareness III discussion FS\_NR\_XR\_enh

*Withdrawn:*

[R2-2211829](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211829.zip) Discussions on L2 structure of XR Fujitsu discussion Rel-18 FS\_NR\_XR\_enh Withdrawn

#### 8.5.2.2 PDU prioritization

Including discussion on whether PDU prioritization is needed for XR traffic, and how should it work, e.g. whether there are impacts to LCP mechanism, how does the PDU set importance work, etc.

Online 2 (Tuesday) (3)

[R2-2211598](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211598.zip) LCP Impacts for XR Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

*Proposal 1: LCP does not need to be enhanced to deal with the PDB of XR services.*

*Proposal 2: in tiled stream approach, all tiles should be carried on the same radio bearer, or at least on radio bearers ensuring a similar BLER over the air interface and there is no need to enhance LCP to deal with tiles.*

*Proposal 3: when an XR QoS flow is relocated from an old bearer to a new one, the priority of the old bearer is set equal to the priority of the new bearer for as long as the old bearer has data buffered for that QoS flow.*

[R2-2212190](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212190.zip) Discussion about XR-awareness impacts on LCP Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

*Observation 1: In the current LCP mechanism, UE allocates resources only to the selected logical channels.*

*Observation 2: The current LCP mechanism does not consider the remaining PDB of data.*

*Observation 3: UL AR requires significant throughput with quite stringent PDB requirement.*

*Observation 4: The PDB of UL XR traffic is larger than the periodicity of UL XR traffic.*

*Observation 5: For UL AR service, different streams (e.g. I-frame stream and P-frame stream) may be mapped to different LCHs with different priority.*

*Observation 6: Since the current LCP mechanism does not consider the remaining PDB of data, when data on LCH with higher priority arrives, the UE always preferentially transmits data on LCH with higher priority, which may result in the UE being unable to transmit data on LCH with lower priority within the PDB requirement.*

*Observation 7: The current LCP mechanism can ensure the transmission of more important PDU set if PDU sets with different importance are associated with different LCHs with different priority.*

*Proposal 1: In order to solve the impact of arrival of data of a high-priority logical channel on data transmission of a lower-priority logical channel, the remaining PDB of the data buffered in the LCH should be considered during LCP procedure.*

*Proposal 2: Enhance LCP in a way allowing to allocate the resources remaining after the current LCP procedure to be used for data belonging to logical channels which would not be mapped to such resources according to the current LCP mechanism.*

*Proposal 3: RAN2 to confirm that no LCP enhancement is needed to consider PDU set importance if PDU sets with different importance are mapped to LCHs with different priority.*

[R2-2211178](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211178.zip) Discussion on PDU prioritization Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

*Prioritization among different PDU Set Importance*

*Observation 1. If in order delivery is not required, Alternative 111 can support differentiated handling of different PDU Set Importance through configuration of different QoS profiles. No additional enhancements are needed.*

*Proposal 1. If different PDU Set Importance are mapped to the same DRB, this DRB can have multiple RLC entities and logical channels, each of which is used to serve different PDU Set Importance.*

*Delay-aware LCP procedure*

*Observation 2. For bursty flows, network may have to give up some uplink capacity in exchange for their delay performance.*

*Observation 3. If the LCP procedure can take residual delay budget into account when scheduling uplink data, network can more efficiently allocate bandwidth for bursty flows and thus improve uplink capacity.*

*Proposal 2. RAN2 study enhancements to LCP procedure which take residual delay budget of buffered data into account when scheduling uplink data.*

[R2-2211379](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211379.zip) Enhancements to provide differentiated XR handling Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211438](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211438.zip) Considerations on PDU Prioritization CATT discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211492](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211492.zip) Discussion on PDU prioritization for XR awareness vivo discussion Rel-18 FS\_NR\_XR\_enh [R2-2209486](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209486.zip)

[R2-2211526](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211526.zip) PDU-set prioritization for XR ZTE Corporation, Sanechips discussion

[R2-2211585](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211585.zip) Discussion on traffic prioritization of XR traffic Xiaomi Communications discussion

[R2-2211719](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211719.zip) Enhancements for Traffic Prioritization in XR Apple discussion FS\_NR\_XR\_enh

[R2-2211923](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211923.zip) Considerations on XR PDU prioritization Sony discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211958](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211958.zip) Discussion on PDU prioritization OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212130](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212130.zip) Discussion on PDU prioritization Lenovo discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212205](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212205.zip) Discussion on LCP impact Samsung discussion Rel-18 FS\_NR\_XR\_enh [R2-2210013](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210013.zip)

[R2-2212330](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212330.zip) Discussion on PDU prioritization Google Inc. discussion

[R2-2212472](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212472.zip) Discussion on PDU prioritization InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212703](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212703.zip) Impact on PDU Prioritization by XR Awareness CMCC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212759](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212759.zip) Discussion on the prioritization for XR LG Electronics Inc. discussion FS\_NR\_XR\_enh

[R2-2212888](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212888.zip) Discussion on PDU Prioritization Ericsson discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212899](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212899.zip) On potential impacts to LCP mechanisms for XR Futurewei discussion Rel-18 FS\_NR\_XR\_enh

#### 8.5.2.3 PDU discard

Including discussion on how to handle PDU discarding of XR traffic, e.g. do we need new discard timers, how to handle PDU discard in PDCP and/or RLC, etc.

Online 2 (Tuesday) (3)

[R2-2211993](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211993.zip) Discussion on PDU discard NTT DOCOMO, INC. discussion Rel-18

* Focus on P2

*Proposal1: RAN2 to discuss whether PDU/PDU set discard function in gNB transmitter take the same principle as UE transmitter, or PDU level discard (i.e. only discard the packets that exceed the PDB within the PDU set) could be introduced.*

*Proposal2: RAN2 to discuss whether PDU/PDU set discard function is supported at lower layers (e.g. RLC entity)*

*Proposal3: To assist PDU set discard function at lower layer (e.g. RLC entity), introduce PSDB and PDU importance level indicator in PDCP PDU header.*

*Proposal4: For PDU/PDU set discard function, in case the discarded packets have been transmitted to the lower layer, transmitter should inform receiver of the SN of discarded packeted.*

- LGE thinks we should not specify RLC level discard because RLC entity is very simple. If we introduce this, we need to inform the reception gap to transmission side. We did that in UTRA but it was too complicated and was removed in LTE. Ericsson agrees with LGE. It doesn’t really provide gain for XR.

- CMCC thinks it would be fine to support RLC level discard. Could be just inter-layer indication.

- Lenovo sees some benefit since discarding doesn’t happen often now but could occur with XR. If the PDU has been given to lower layers we don’t discard it anymore.

- Nokia thinks we don’t need to enhance discard. SA2 has discussed this earlier but now the dependency between PDU sets has been removed so we only need to consider intra-PDU set discard, but whether we have even that we need to wait for SA2. If discard doesn’t increase, we shouldn’t add extra complexity to radio protocols. Huawei thinks SA2 situation is quite dynamic but agrees inter-PDU set dependency is not supported. Can just reuse SDU discard in RLC.

- BT thinks we shuld bne careful to not tie RAN2 conclusions to SA2. Intel thinks SA2 has currently agreed on dependencies but it’s not clear where they are.

* Noted (need to wait for SA2 conclusions).

[R2-2212129](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212129.zip) Discussion on PDU discarding Lenovo discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P1

*Proposal 1: RAN2 to support timer-based discarding of PDU/SDUs of a PDU set, e.g. PDU/SDUs of a PDU set exceeding the PSDB. RAN2 to further discuss how to enforce PDU discarding on a PDU set level, e.g. UE may consider the PDCP discard timers of all the PDCP SDUs associated with an PDU set as expired for cases when the PDCP discard timer of one PDCP SDU expires.*

- Nokia thinks PDU set discarding means all PDUs are discarded at the same tie. So timers for all PDUs in the PDU set is started at the same time? CATT thinks this depends on whether we ca assume all PDUs in the PDU set arrive at the same time. If they do, we can reuse legacy mechanism. If not, then we need one timer started at the first PDU but it sill applies to all PDUs.

- Samsung thinks timer details can be left to WI phase. Should be based on NW configuraton. MTK thinks all UL packet shuld arrive at the same time at UE. Hence we can reuse legacy mechanism. ZTE is not sure application layer delivers all the pckets at the same time, rather they would come sequentially. Lenovo thinks it’s not always sure packets arrive at the same time but w can still reuse current PDCP discard timer. Ericsson thinks all PDCP SDUs expire at the same time. LGE thinks this is a modelling issue whether we have one timer ot multiple timers. Intel is ok with current proposal as baseline but we also think that this will probably have to be considered/enhanced in conjunction with whether the application may be able to work with even partially received PDU set. We are okay with the first part of the proposal only “RAN2 to support timer-based discarding of PDU/SDUs of a PDU set.”. Details of how the timer is configured can be discussed in WI phase. MTK thinks it’s not yet clear if the existing mechanism is sufficient. Could also clarify from SA4.

* RAN2 to support timer-based discarding of UL transmit side of PDCP PDU/SDUs of a PDU set. FFS how this is modelled in PDCP specification, can be discussed in WI phase.

*Proposal 2: NW configure the legacy PDCP discard timer and PDU set integrity indication, e.g. information provided by CN, to enable the timer-based discarding of PDU/SDUs of a PDU set.*

*Proposal 3: RAN2 to discuss whether discarding of PDUs in a PDU set before expiration of the PDCP discard timer in case of UL congestion is supported.*

*Proposal 4: RAN2 to discuss enhancements to the discarding mechanism, e.g. informing receiving entity about discarded packets at the transmitter side, which may impact PDCP/RLC window operation.*

*Proposal 5: RAN2 should discuss UE reporting enhancements to inform gNB about discarded PDU/SDUs at the transmitter side, e.g. when the delay budget is exceeded for data which has been previously reported in a BSR*

[R2-2212331](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212331.zip) Discussion on PDUs Discarding Google Inc. discussion

* Focus on P1, P4

*Proposal 1: The two options below are supported and configurable by the network:*

*• Option 1: the remainder of the PDUs in the PDU Set should be discarded in case a PDU meets the discard criteria*

*• Option 2: the remainder of the PDUs in the PDU Set are still delivered in case a PDU meets the discard criteria.*

- Samsung wonders if the configuration would be per DRB or PDU set? What does discard criteria mean? CMCC agrees with intent of P1 but SA2 is still discussing these options. So we can’t decide yet. vivo agrees with CMCC that we could list options but not yet agree. Could still specify only one option. Could be also some PDUs meet the criteria but not all.

- Meta thinks SA2 agreed to specify at least first option. Agrees with CMCC that we can just consider both options for now. NEC agrees we could dicuss both options. Intel agrees with P1. OPPO agree the configurability, and it could be per DRB. LGE thinks we have only one criteria and shouldn’ät discuss this now. Should wait until we have understanding on new criteria. Hauwei thinks SA2 sent LS that there are QoS criteria parameters, which map to these options. Agrees with P1 and there could be third option but that is still under SA2 discussion. Lenovo agrees with Huawei. MTK thinks we could hust say discard is configurable. ZTE thinks option 2 is legacy.

*Proposal 2: For UE transmitter, if the UE decides to discard a PDU Set, the UE transmits to the gNB a cancellation indication to cancel the remaining CG-PUSCH resources of the PDU Set.*

*Proposal 3: UE signals to the network an indication about the discarded data, ignores a DCI scheduling a retransmission if any and requests the network to terminate the HARQ process.*

*Proposal 4: Network can request the UE to discard an UL PDU Set due to PDUs decoding failure after HARQ retransmissions.*

- NEC thinks Network may not know which PDU Set is lost. (1) the receiver (network here) may not know the PDU Set SN if the SN is not transmitted in band. (2) if the receiver fails to receive the MAC PDU, it doesn't know which PDU Set is lost. (3) multiple SDU/PDUs belonging to different PDU Set may be multiplexed in the same MAC PDU. Huawei agrees.

[R2-2211179](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211179.zip) Discussion on PDU discard Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211380](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211380.zip) Packet discard for XR traffic Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211439](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211439.zip) PDU Discard of XR services CATT discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211493](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211493.zip) Discussion on PDU discard for XR awareness vivo discussion Rel-18 FS\_NR\_XR\_enh [R2-2209487](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209487.zip)

[R2-2211525](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211525.zip) PDU-set discard functionality for XR ZTE Corporation, Sanechips discussion

[R2-2211587](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211587.zip) Discussing on PDU discarding of XR traffic Xiaomi Communications discussion

[R2-2211599](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211599.zip) PDU Discard for XR Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211720](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211720.zip) Packet Discarding and Reordering Enhancements for XR Apple discussion FS\_NR\_XR\_enh

[R2-2211859](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211859.zip) On PSDB and PDU discard MediaTek Inc. discussion Rel-18 FS\_NR\_XR\_enh [R2-2210650](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210650.zip)

[R2-2211924](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211924.zip) Considerations on XR PDU discard Sony discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211959](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211959.zip) Discussion on PDU discard OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212098](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212098.zip) PDU Set and PDCP Discard Handling Samsung R&D Institute India discussion Rel-18

[R2-2212164](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212164.zip) PDU discard of XR traffic Spreadtrum Communications discussion Rel-18

[R2-2212191](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212191.zip) Discussion on PDU discarding for XR traffic Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212473](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212473.zip) Discussion on PDU discard InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212537](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212537.zip) Discussion on PDU discard for XR awareness NEC Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212582](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212582.zip) Discussion on PDU Discard Meta USA discussion Rel-18

[R2-2212702](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212702.zip) Considerations on PDU Discarding of XR Traffic CMCC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212758](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212758.zip) Discussion on the discard and retransmission LG Electronics Inc. discussion FS\_NR\_XR\_enh

[R2-2212887](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212887.zip) Discussion on PDU Discard Ericsson discussion Rel-18 FS\_NR\_XR\_enh

### 8.5.3 XR-specific power saving

No documents should be submitted to 8.5.3. Please submit to 8.5.3.x

#### 8.5.3.1 DRX enhancements

Including discussion on how DRX can be configured for XR, how to switch between DRX configurations and how does that impact power saving.

Including discussion on whether/what RAN2 needs for the non-integer DRX periodicity.

Including discussion on whether XR requires multiple DRX configurations active at the same time.

Online 4 (Wednesday) (3)

[R2-2211180](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211180.zip) DRX enhancements for XR Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P2, P5

*Non-integer valued DRX cycles*

*Observation 1. As different options are possible to address the issue of mismatch between non-integer periodicity of XR traffic and integer valued DRX cycles, RAN2 should first agree on a set of criteria for the downselection of different options.*

*Observation 2. If DRX cycle has a non-integer value, the start time of DRX on duration can drift irregularly when when SFN wraps around (i.e. returns to 0), which can cause extra delay and higher power consumption for UE.*

*Adaptive DRX configurations*

*Observation 3. Many XR applications are capable of adapting their bit/frame rates based on the quality of their connections.*

*Observation 4. RAN/UE need to adapt UE’s DRX configuration to match application’s rate adaptation in a timely manner, to ensure consistent QoS performance.*

*Multiple DRX configurations*

*Observation 5. Traffic flows other than video have small and regular sized data and hence can be efficiently supported by SPS/CG.*

*Observation 6. It is more power efficient to use SPS/CG instead of DRX to serve traffic flows with small and regular data arrivals.*

*Observation 7. A single DRX configuration, together with multiple SPS/CG configurations or power saving features such as PDCCH skipping, is sufficient to support mixed traffic flows with different periodicities.*

*Observation 8. Enhancement for multiple independent DRX configurations has significant impact on the current DRX procedure but does not have clear power saving benefits.*

*End of burst indication for DRX*

*Observation 9. Currently it is not easy for gNB to know when a UL burst ends.*

*Observation 10. With XR traffic’s short periodicity, UE may not be able to have much sleep between two bursts if it relies on DRX inactivity timer to terminate DRX active time.*

*Observation 11. Network will be able to terminate DRX active time sooner if UE can provide indication on when a UL burst ends.*

*UL skipping and DRX/BWP inactivity timer*

*Observation 12. UL skipping or UL Tx without data is more likely to happen with XR, which causes UE to unnecessarily re-/start DRX/BWP inactivity timer and thus waste power.*

*PDCCH Skipping and DRX Enhancements*

*Observation 13. Suspending PDCCH skipping during retransmissions is useful for DG and CG.*

*Non-integer valued DRX cycles*

*Proposal 1. Based on evaluation results provided by RAN1, RAN2 apply the following criteria to down select options for supporting non-integer DRX cycles:*

*- a selected option should be able to support all currently known frame rates of XR applications;*

*- a selected option should enable the most power saving gain;*

*- a selected option should result in the least variations in the start time of DRX on durations;*

*- a selected option should have the least impact on the current DRX procedure and the current RAN1/2/4 specs.*

*Proposal 2. RAN2 study the following options to support DRX cycles with non-integer values:*

*- Option A. Add new values of DRX cycles represented in rational numbers;*

*- Option B. Use cadence instead of periodicity of DRX cycle to calculate the start time of DRX on duration.*

- Nokia thinks we can state generic intent to handle non-integer periodicities. Doesn’t like to use non-integer values in calculations. Thinks modulo operation can be implemented differently, so there could be discrepancies. Huawei thinks the solutions may be feasible but there may be others. Thinks we could prioritize semi-static solutions over dynamic ones.

- MTK thinks we should have a straightforward solution to a straightforward problem. We just align to the traffic. Prefers option A.

* RAN2 aims to allow XR frame rates that correspond to non-integer periodicities in at least semi-static manner (e.g. RRC). Details can be left to WI phase.

*Proposal 3. RAN2 study enhancements to avoid irregular start time of DRX on durations due to SFN wrap around when non-integer valued DRX cycles are configured.*

*Adaptive DRX configurations*

*Proposal 4. RAN2 study dynamic adaptation DRX configurations. FFS which DRX parameters should be included in this enhancement.*

*Multiple DRX configurations*

*Proposal 5. Study on multiple independent DRX configurations is deprioritized in R18.*

*Reduced monitoring at start of DRX on duration*

*Proposal 6. Network can configure UE to always start its DRX on durations with a set of power-optimized configurations that enable reduced PDCCH monitoring by UE. FFS which configurations should be included.*

*End of burst indication for DRX*

*Proposal 7. RAN2 study enhancements for UE to indicate either end of a UL burst or its preference to terminate DRX active time.*

*UL skipping and DRX/BWP inactivity timer*

*Proposal 8. RAN2 study whether/when UE should re-/start DRX/BWP inactivity timer when it performs UL skipping or UL Tx without data.*

*PDCCH Skipping and DRX Enhancements*

*Proposal 9. RAN2 recognizes an RRC configurable option to not allow DRX transition to active for retransmission timers or allow cancellation of PDCCH skipping only upon DRX transition to active due to duty cycle but not due to retransmissions.*

[R2-2211775](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211775.zip) DRX enhancements for XR Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P1, P5, P7

*Proposal 1: RRC configuration is used for the UE to automatically adjust the drift every few cycles to compensate the accumulated gap due to the misalignment of XR and DRX periodicities. Details can be left to WI phase.*

*Proposal 2: adjusting of DRX cycle is beneficial to handle multi-flows as well as frame rate change for single flow without RRC reconfiguration.*

*Proposal 3: adjusting of DRX start offset could be considered as a solution to address SFN wrap around issue.*

*Proposal 4: simultaneous multiple active DRX configurations is not supported.*

*Proposal 5: the mechanism from NTN for HARQ less operation can be reused for XR to allow not starting HARQ RTT timer and retransmission timer for certain HARQ processes.*

*Proposal 6: different retransmission timer values for different UL grants or LCHs is not pursued.*

*Proposal 7: Automatic extension of active time when there is no data scheduled during the OnDuration of the DRX cycle is considered as a potential solution to address the jitter issue to allow configuration of shorter onDuration than the full jitter range.*

[R2-2212886](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212886.zip) Discussion on DRX enhancements Ericsson discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P3

*Observation 1 Depending on the network load and the traffic generation rate, different C-DRX solutions need to be applied to maximize power savings and to achieve a high fraction of satisfied UEs.*

*Observation 2 To enhance and/or configure C-DRX power saving features, the network needs per-XR flow information: - traffic periodicity and periodicity changes; - PDU Set jitter information; - delay budget or remaining PDB of the PDU Set for radio interface; - PDU Set sequence number carried in each constituent PDU; and - PDU Set size.*

*Observation 3 Matching the DRX cycle with the non-integer video periodicity is a good solution to maintain a low delay, while saving UE power, for high network loads and high traffic generation rates.*

*Observation 4 SFN wrap-around may affect XR traffic by introducing additional delay and resulting in a waste of UE power.*

*Observation 5 It is necessary to enhance C-DRX to cope with traffic jitter, in order to save more UE power, while not increasing the traffic delay significantly.*

*Observation 6 Two-stage DRX saves significant UE power, while not increasing the delay significantly (and thus achieving many satisfied UEs).*

*Observation 7 A single DRX configuration matched to a traffic flow may not be suitable to fulfil the PDBs of other traffic flows, resulting in zero capacity.*

*Observation 8 Multiple simultaneous DRX configurations, each matching a traffic flow, is suitable to achieve both high UE power saving gains and many satisfied UEs, if a single DRX configuration matched to one flow does not satisfy the PDBs of other flows.*

*Proposal 1 Enhance Long DRX formula to match non-integer XR traffic periods as described in this section, by adding two new parameters: (i) a fixed time shift for the start of drx-onDurationTimer; and (ii) a number of DRX cycles after which the new shift should be added.*

*Proposal 2 New integer values in ms for Long DRX cycle lengths (e.g. {8, 9, 11, …, 16, …33, …} ms), close to non-integer XR traffic periodicities are introduced.*

*Proposal 3 Solve the SFN wrap-around problem in the DRX formula, by introducing a counter which increments every time that SFN wraps around.*

*Proposal 4 Adopt the two-stage DRX solution to handle jitter for quasi-periodic XR traffic flows.*

*Proposal 5 Support multiple simultaneous DRX configurations to optimize power saving of UEs with multi-flow XR services.*

*Proposal 6 Switching between pre-configured DRX configurations should not be considered for XR traffic.*

*Proposal 7 Adopt the text proposal below for Section 5.2.2 of TR 38.835.*

[R2-2211860](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211860.zip) C-DRX enhancements for XR MediaTek Inc. discussion Rel-18 FS\_NR\_XR\_enh [R2-2210651](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210651.zip)

* Focus on P3-4

*Non-integer DRX cycles:*

*Observation 1: It is not possible to align DRX on-duration occasions with XR traffic using legacy DRX cycles with integer values.*

*Observation 2: eC-DRX using rational DRC cycle value matching CG traffic improves both power savings and UE satisfaction rate compared to Rel-17 C-DRX.*

*Observation 3: Using legacy DRX formulas with non-integer (rational number) DRX cycles do not produce expected results when determining the subframes to start the ODT.*

*Observation 4: By introducing two new parameters per short and long DRX cycles: dividend and divisor in RRC configuration, a wide range of rational number DRX cycles can be supported by Eq6 and Eq7. The valid range for the parameters can be discussed during the work item.*

*Observation 5: With multiple active DRX configuration and multiple start offset solutions for periodicity mismatch issue, RAN2 must decide on the maximum number of configurations, which may not be future proof for supporting different frame rates.*

*Observation 6: Using the new DRX formulas as in Eq 6 and Eq 7, short and long DRX cycles can be supported very easily. Whereas, with the multiple active DRX configuration and multiple start offset solutions, supporting short and long DRX cycles can be complicated.*

*SFN wraparound:*

*Observation 7: If C-DRX cycle values that are not factors of 10240ms are introduced in XR and legacy C-DRX formulas are used, DRX on-duration will go out of sync with XR traffic after the SFN wraparound.*

*Stopping ODT early:*

*Observation 8: Stopping ODT early + eC-DRX provides significant power savings with marginal impact on UE satisfaction rate compared to Rel-17 C-DRX.*

*Observation 9: Stopping ODT early might provide better power savings gain than active time extension (when no data received), because the UE will not have to stay awake longer than needed.*

*Gaps in On Duration:*

*Observation 10: Introducing gaps in ODT + stopping ODT early + eC-DRX provides significant power savings with marginal impact on UE satisfaction rate over Rel-17 C-DRX.*

*Disable DRX retransmission timer for CGs:*

*Observation 11: CG is suitable for transmitting UL pose/control information.*

*Observation 12: With UL traffic periodicity of 4 ms, UE does not have much opportunity to go to sleep between UL transmissions.*

*Observation 13: UL pose/control traffic does not constitute a bottleneck for capacity for XR deployments.*

*Non-integer DRX cycles:*

*Proposal 1: Introduce non-integer (rational number) DRX cycles to match typical XR traffic patterns.*

*Proposal 2: Enhance C-DRX formulas to support non-integer (rational number) DRX cycles, by replacing modulo operation with the floor function as in Eq6 and Eq7 above.*

*SFN wraparound:*

*Proposal 3: Enhance legacy C-DRX formulas to resolve the issue with SFN wraparound when DRX cycle is not a factor of 10240ms.*

*Proposal 4: To solve the SFN wraparound issue while supporting non-integer (rational number) DRX cycles, introduce a new SFN (E-SFN) and update the C-DRX formulas as in Eq8 and Eq9 above.*

*Stopping ODT early:*

*Proposal 5: Reduce DRX on-duration after the arrival of data by stopping ODT to enable the UE to go to sleep early.*

*Gaps in On Duration:*

*Proposal 6: Split the DRX on-duration into groups of smaller on-durations by introducing gaps to maximize opportunities for the UE to go to sleep.*

*Proposal 7: Enhancements for stopping ODT early and splitting DRX on-durations can be combined: The ODT is stopped and remaining on-durations in the group are skipped after the arrival of data.*

*Disable DRX retransmission timer for CGs:*

*Proposal 8: drx-HARQ-RTT-TimerUL and drx-RetransmissionTimerUL are not started for transmissions performed on specific CG configurations, for example, ones reserved for UL pose/control traffic.*

[R2-2211715](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211715.zip) DRX Enhancements for XR Apple discussion FS\_NR\_XR\_enh

[R2-2212812](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212812.zip) Discussion on power saving scheme for XR Samsung discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211298](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211298.zip) Discussion on CDRX enhancement for Power saving OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211278](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211278.zip) Further discussion on C-DRX enhancements for XR Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211297](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211297.zip) Discussion on CDRX enhancement for XR service OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211381](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211381.zip) C-DRX enhancements for XR traffic Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211426](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211426.zip) Considerations on XR jitter handling KDDI Corporation discussion FS\_NR\_XR\_enh

[R2-2211440](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211440.zip) Enhancements for XR Power Saving CATT discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211494](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211494.zip) Discussion on DRX enhancements for XR power saving vivo discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211529](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211529.zip) DRX enhancements for XR ZTE Corporation, Sanechips discussion

[R2-2211588](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211588.zip) Discussing on XR-specific C-DRX enhancements Xiaomi Communications discussion

[R2-2211925](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211925.zip) Considerations on XR specific C-DRX power saving enhancements Sony discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212040](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212040.zip) Discussion of DRX enhancement Lenovo discussion Rel-18

[R2-2212237](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212237.zip) Candidate solutions on C-DRX enhancement NEC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212249](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212249.zip) On DRX enhancements for handling non-integer traffic periodicity Futurewei discussion Rel-18 FS\_NR\_XR\_enh [R2-2209502](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209502.zip)

[R2-2212332](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212332.zip) DRX Enhancement for XR Google Inc. discussion

[R2-2212474](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212474.zip) Discussion on DRX enhancements InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212579](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212579.zip) DRX enhancement for power saving in XR LG Electronics Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212631](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212631.zip) Discussion on DRX enhancements CMCC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212770](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212770.zip) C-DRX enhancements for XR-specific power saving DENSO CORPORATION discussion Rel-18 FS\_NR\_XR\_enh

#### 8.5.3.2 Other enhancements

Including discussion on how traffic and QoS related information on uplink traffic should be provided to RAN for UE power savings.

Online 4 (Wednesday) (2)

[R2-2211495](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211495.zip) Uplink XR Traffic Information for Power Saving vivo discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P1-2

*Proposal 1: Among the traffic information agreed to be provided from CN to RAN for power saving, the counterpart of uplink traffic which is useful for power saving includes: periodicity for UL traffic of the QoS Flow, end of Data Burst indication. UL traffic jitter information is not useful for power saving.*

*Proposal 2: The following information of uplink traffic is useful for power saving: start time of the first PDU of a PDU set and PDU set size (number of bits), PDU set identity and relationship information among PDUs within the same PDU set.*

*Proposal 3: UE sends an indication to gNB when the last PDU of a data burst in UL buffer has been sent to gNB. FFS whether the indication is a UCI or MAC CE.*

*Proposal 4: Start time and size of PDU set are reported by extending the current BSR. Details are FFS.*

[R2-2212632](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212632.zip) Discussion on Information for UE power saving CMCC discussion Rel-18 FS\_NR\_XR\_enh

* Focus on P1, P3

*Observation 1: Core network may provide RAN with the following pieces of information: PDU set periodicity and start time, PDU set end indication, PDU set level QoS parameters, PDU set size (number of bits) or number of PDUs in a PDU set, PDU set identity and relationship information among PDUs within the same PDU set, and Jitter information.*

*Observation 2: XR traffic streams in UL has similar characters with DL streams.*

*Proposal 1: The information agreed to provide for RAN for DL in SA2, e.g., PDU Set QoS parameters, can be the baseline of UL.*

*Proposal 2: Static information of UL stream can be acquired by RAN from CN.*

*Proposal 3: RAN2 can further discuss whether start PDU and end PDU of the PDU set, PDU SN and PDU set size should be provided by UE.*

*Proposal 4: PDB/latency information can be reported via BSR, and either residence time or remaining time reporting is possible solution.*

[R2-2211181](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211181.zip) Non-DRX power saving enhancements for XR Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211277](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211277.zip) Analysis on XR traffic characteristics for C-DRX enhancement Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211382](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211382.zip) Information in RAN for XR traffic and congestion Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211528](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211528.zip) Other Power Saving enhancements for XR ZTE Corporation, Sanechips discussion

[R2-2211721](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211721.zip) PDU Set Parameters and Descriptors Apple discussion FS\_NR\_XR\_enh

[R2-2211776](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211776.zip) QoS related information in Uplink Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212041](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212041.zip) Discussion of other power saving enhancement Lenovo discussion Rel-18

[R2-2212171](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212171.zip) Discussion on power saving in XR Spreadtrum Communications discussion Rel-18

[R2-2212172](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212172.zip) Align the uplink and downlink transmission for XR Spreadtrum Communications discussion Rel-18

[R2-2212206](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212206.zip) Discussion on power saving impact of packet discard operation Samsung discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212475](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212475.zip) Discussion on other XR power enhancements InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212580](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212580.zip) Information on uplink traffic for power saving LG Electronics Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212891](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212891.zip) Discussion on UL and DL traffic information for power saving Ericsson discussion Rel-18 FS\_NR\_XR\_enh

### 8.5.4 XR-specific capacity improvements

No documents should be submitted to 8.5.4. Please submit to 8.5.4.x

#### 8.5.4.1 Feedback enhancements

Including further discussion on how enhanced BSR works for XR (e.g. information needed, overhead, impact to capacity, etc.).

Online 3 (Wednesday) (2)

[R2-2211600](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211600.zip) BSR for XR Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

*Proposal 1: introduce BSR table(s) generated based on traffic characteristics (min, max, shape) signalled to the UE.*

*Proposal 2: introduce a delay information in the BSR as an extension of the current BSR format.*

*Proposal 3: a periodic BSR is triggered when the ON-DURATION is started.*

*Proposal 4: PDU discard triggers a BSR.*

- Huawei thinks we could also configure multiple BSR tables instead of a formula. Supports P2/4.

- QC thinks it’s difficult to dynamically generate BSR table. We know the XR traffic characteristics rather well. Samsung agrees dynamic construction is more flexible for traffic but thinks we need to discuss the parameters in WI phase. Doesn’t agree with P3 since we don’t aways need to associate UL traffic with DL traffic. vivo thinks dynamic BSR table is not needed but configuration to generate can be OK, e.g. via step size that can change. Supports P2/4.

- LGE thinks most companies prefer static BSR table since it’s well known and we discussed this in LTE CA times already. Thinks P2 may be OK but format needs more thinking. Exact time information may be difficult to include since UE would have to calculate the remaining time for each PDU and there are some processing time impacts to the calculation.

- CMCC prefers multiple BSR tables since the parameters to generate the tables may not exist. KDDI wonders if P2 is clear in what delay information is?

- Ericsson thinks we have multiple different applications that behave differently. It’s rare that network would change the BSR table regularly. Also agrees delay information is useful. Not sure if P3 is needed since DL and UL are not in sync, and P4 could be done differently.

- Nokia agrees we discussed new BSR tables in the past but this is different since we have RT servies with variable bitrates. In the past usefulness of BSR was less clear, now its different. We have to be able to schedule large amounts of data in a short time, so having BSR helps a lot more. Thinks multiple tables will just lead to long discussions on how the tables are created. Delay can be discussed in WI phase. Thinks we have similarities to voice but we have to schedule lot of data.

- ZTE is skeptical about dynamic formular but agrees the problem exists. We already have multiple tables now and could use more than one BSR. Agrees with LGE on the delay information being imprecise as UL scheduling delay also matters and value cannot be changed afterwards. Has sympathy with P4 but not sure it’s at MAC or PDCP.

- CATT has no strong view on the table but thinks we agreed to look at the delay information. Thinks triggering BSR at OnDuration happens earlier due to jitter, which comes from codec itself. It’s unlikely we have data at start of OnDuration.

- Google is not sure about the BSR table generation as network needs to derive it somehow per application. Wonders if that creates lot of load for the network as it can vary a lot. thinks delay us useful but need to consider overhead and urgent/non-urgent data. Thinks we could also report discarded data as that will be smaller amount.

- Xiaomi wonders if we need to support both P2 and P3.

* RAN2 thinks we need one or more additional BSR table(s) for XR. FFS whether these are static (=specified) or dynamic (e.g. generated, differs according to some RRC parameter), can be discussed in WI phase.
* RAN2 will introduce data volume information associated with delay information (e.g. remaining time) in a MAC CE. FFS if this is extension of BSR or new format. FFS how to do that (e.g. what exactly is reported) and how to ensure this information is up-to-date e.g. considering UL scheduling delay.
* RAN2 needs to discuss additional BSR triggering conditions to allow timely availability of buffer status information at gNB. This can be discussed in WI phase.

[R2-2212517](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212517.zip) Discussion on BSR enhancements Futurewei discussion Rel-18 FS\_NR\_XR\_enh

*Proposal 1. RAN2 consider introducing new Buffer Size table(s) to support finer granularity for the Buffer Size field in the BSR.*

*Proposal 2. If new Buffer Size table(s) are to be introduced, a linear quantization scheme should be used.*

*Proposal 3. RAN2 consider standardizing a linear formula with configurable parameters to support finer granularity for the Buffer Size field in the BSR.*

*Proposal 4. If the standardized linear formula is to be introduced, a step size and a starting size can be the configurable parameters used in the formula. FFS: whether value 0 and/or the highest value of the Buffer Size field are interpreted in an open-ended way or not.*

*Proposal 5. Data volume calculation and reporting can be performed for an XR traffic stream on a per data burst basis.*

*Proposal 6. RAN2 decide whether remaining time information is explicitly indicated or not.*

*Proposal 7. If remaining time information is to be explicitly indicated, only one remaining time is explicitly indicated, and based thereon, the other remaining time can be derived by the gNB.*

*Proposal 8. RAN2 adopt the text proposed in the Annex into TR 38.835, under Capacity Improvements Techniques, Layer 2.*

[R2-2211182](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211182.zip) UE feedback enhancements for capacity improvement Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211275](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211275.zip) BSR feedback enhancements for XR Dell Technologies discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211319](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211319.zip) Discussion on multi-modal synchronization for XR TCL Communication Ltd. discussion

[R2-2211383](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211383.zip) Enhancements to Buffer Status Reporting for XR traffic Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211394](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211394.zip) Discussion on BSR enhancements for XR Samsung discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211441](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211441.zip) Further consideration on BSR CATT discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211496](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211496.zip) Discussion on feedback enhancements for XR-specific capacity improvements vivo discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211530](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211530.zip) fFeedback enhancements for XR capacity ZTE Corporation, Sanechips discussion

[R2-2211590](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211590.zip) Discussing on UE feedback enhancements for XR capacity Xiaomi Communications discussion

[R2-2211716](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211716.zip) Considerations for BSR Enhancements Apple discussion FS\_NR\_XR\_enh

[R2-2211926](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211926.zip) Considerations on BSR Sony discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211960](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211960.zip) Discussion on feedback enhancement OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211975](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211975.zip) Discussion on BSR enhancement for XR-specific capacity improvement Huawei, HiSilicon discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212139](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212139.zip) Discussion of UE feedback enhancements Lenovo discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212173](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212173.zip) BSR enhancement on XR Spreadtrum Communications discussion Rel-18

[R2-2212235](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212235.zip) BSR enhancements for XR NEC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212318](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212318.zip) BSR enhancement for XR capacity MediaTek Inc. discussion Rel-18

[R2-2212476](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212476.zip) Discussion on XR-specific feedback enhancements InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212636](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212636.zip) Enhancement on BSR for XR-specific capacity improvement CMCC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212715](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212715.zip) Discussion on Feedback enhancements for XR-specific capacity improvements III discussion FS\_NR\_XR\_enh

[R2-2212771](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212771.zip) Discussion on UE feedback enhancements for XR capacity DENSO CORPORATION discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212783](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212783.zip) draft Reply LS on XR and Media Services on Network exposure Xiaomi Communications LS out Rel-18 FS\_XRM, FS\_NR\_XR\_enh To:SA2 Cc:RAN1, RAN3

[R2-2212787](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212787.zip) Discussion on BSR enhancement for delay information in XR LG Electronics Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212885](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212885.zip) Discussion on BSR enhancements Ericsson discussion Rel-18 FS\_NR\_XR\_enh

*Withdrawn:*

[R2-2211318](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211318.zip) Discussion on multi-modal synchronization for XR TCL Communication Ltd. discussion Withdrawn

#### 8.5.4.2 Scheduling enhancements

Including discussion on scheduling enhancements to improve XR capacity.

Including discussion on RAN2 aspects of CG enhancements and UE assistance information for XR.

Online 2/3 (Tuesday/Wednesday) (3)

[R2-2212890](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212890.zip) Discussion on Scheduling enhancements Ericsson discussion Rel-18 FS\_NR\_XR\_enh

*Observation 1 Utilizing CG to increase PDCCH capacity is not necessary since PDCCH capacity is not assumed to be a problem for XR*

*Observation 2 CG for XR data (large allocations) performs equal or worse than basic DG*

*Observation 3 When scheduler is aware of detailed traffic periodicity information utilizing DG with prescheduling performs better than CG with large allocations*

*Observation 4 A hybrid approach of using CG for BSR transmissions and DG for video data transmissions work well but is already fully supported by the standard*

*Observation 5 Addressing shortcomings of CG requires a complex signalling coming with delay and its cost is higher than benefits.*

*Observation 6 UL jitter (if any) and packet size information can be learned by gNB based on SR/BSR without explicit indication.*

*Proposal 1 RAN2 should consider that CG enhancements are not needed in Rel-18 XR*

- Samsung agrees with P1. CMCC thinks CG enhancemnets are neded fro capacity in UL.

- CATT disagrees and thinks CG enhancements is needed and RAN1 concluded it’s one option. Thinks HARQ determination is necessary to allow NR-U CG for XR. LGE thinks CG enhancement are needed according to RAN1. To support multiple traffic flows we need multiple CGs. Apple thinks we could wait for RAN1 but now they agreed to allow CG options. Lenovo also agrees there wil be some RAN2 impacts from RAN1 agreement. QC also thinks CG enhancements are useful since RAN1 agrees to study adaptation of CG occasions. Could also use CG to address DRX periodicity mismatches. OPPO also disagrees with P1.

- Vodafone thinks we need to look at what was agreed in RAN1. KDDI agrees.

- Ericsson agrees that we can address what RAN1 agrees but nothing else.

- ZTE thinks we should first conclude whether CG is useful for XR. Nokia agrees with ZTE. Huawei thinks using CG costs some radio resources.

*Proposal 2 Additional assistance information is not needed to configure UL CG.*

*-* Samsung thinks UE assistance information could still be useful for setting UE configuration based on used traffic. CMCC agrees. Apple also agrees that it’s more efficient if UE can provide some information to gNB. OPPO thinks UE assistance is useful according to SA2 conclusions.

*-* Vodafone thinks assistance info has to be useful and it has to be clear all UEs report the same thing. Nokia also thinks this is not very useful. Huawei agrees that TSCAI is only thing that is needed. KDDI wonders if we have any evidence on the gains.

*Proposal 3 Introduce the draft TP attached in the Annex*

* RAN2 sees some benefit from CG to XR services. RAN2 will address enhancements triggered by RAN1 work.

[R2-2212936](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212936.zip) Discussion on scheduling enhancements NTT DOCOMO, INC. discussion Rel-18

*Observation1: In XR service, there exists interactive service period where both UL and DL data arrives frequently. Efficient scheduling DL/UL traffic and DRX config in the corresponding period is considered to be important to fulfill XR service low latency and power saving requirement.*

*Proposal1: UE to send XR interactive service period related assistance info (e.g., interactive service period’s starting time, end time, cycle length, periodicity, uplink data arrival periodicity, jitter, etc) to network for efficient CG scheduling and DRX configuration purpose.*

- Chair wonders if the metrics would be standardized? DCM thinks this can be discussed but it may be difficult. Vodafone wonders if the information is useful, e.g. jitter in UL is not useful. CMCC thinks this information is beneficial but wonders if we need separate UL and DL information.

- Apple thinks traffic periodicity could be useful. E.g frame rates can change dynamically, which can impact how scheduling is done. We already have UAI to allow some assistance. Thinks TSCAI is not always available so this would complement that. META agrees and thinks some information e.g periodicity is useful. We can leave details to WI phase.

- Nokia thinks TSCAI should be starting point.

- LGE thinks we need to ensure assistance information needs to be standardized.

- Intel thinks we agreed UL and DL information should be similar. What remains is whether this comes from CN or from UE (UL), and this depends on SA4.

* RAN2 agrees some assistance information can be beneficial (e.g. periodicity, packet size). RAN2 assumes baseline could be TSCAI (pending SA2 conclusions), can discuss during WI phase whether something additional is needed on top of that. If any assistance information is needed, its definition should be standardized.
* RAN2 thinks all information may not be always available at UE application.

[R2-2211601](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211601.zip) Capacity Enhancements for XR Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_XR\_enh

*Proposal 1: investigate blind retransmissions of RLC PDUs.*

- Ericsson doesn’t see the usefulness because we use RLC UM. With AM you always have retransmissions. Nokia thinks we are targeting something in between. Intel thinks if we have different reliability for different PDU sets.

- QC thinks this can be left up to UE implementation. Nokia thinks BSR is used so this can’t be left up to UE implementation.

- LGE supports blind retransmissions to avoid RLC AM status report -induced delays. Lenovo is not sure we need this since we have L1 repetition. Apple thinks in URLLC we use PDCP duplication so wonders if that can be used to do the same thing.

* Noted

*Proposal 2: investigate the concatenation of PDCP SDUs belonging to the same PDU set at PDCP.*

*Proposal 3: RAN2 to confirm it is already possible to configure and simultaneous activate multiple overlapping CG configurations.*

*Proposal 4: the restriction of no HARQ process sharing for licensed band should be lifted to allow more flexibility for NW configuration.*

*Proposal 5: The UE may take TBS of the CG and buffered data into account (on top of existing LCP restrictions and LCH prioritization rules) when selecting an UL grant to use when there are multiple grants.*

[R2-2211527](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211527.zip) Scheduling enhancements for XR ZTE Corporation, Sanechips discussion

*- CG and DG enhancements*

*Proposal 1: Multiple CG grants can be configured to the UE to handle traffic with more than one inherent periodicity within the XR traffic*

*Observation: Using CG for traffic that has significant variance in packet size over time is suboptimal and hence some optimisations are necessary*

*Proposal 2: Combination of CG with DG could be used to minimise the latency for packets that exceed the CG grant size*

*Proposal 3: To minimise the UL latency for traffic that exceeds the CG grant size, RAN2 should study mechanisms where the UE can include an indication such as BSR whenever the pending UL data exceeds the CG grant size*

*- UE assistance information for gNB scheduler*

*Proposal 4: RRC level assistance information could be used for providing long-term assistance information from UE to RAN for XR*

*Proposal 5: UE Assistance Information (UAI) framework is reused for the long-term assistance information for XR*

*Proposal 6: The long-term assistance information for XR could include information such as the Periodicity, Burst size, Burst size variance, Burst timing associated with XR traffic*

*Proposal 7: Time critical UE assistance information such as need to activate/deactivate certain CG resources depending on the codec modes used etc should be provided using MAC level assistance information (i.e. MAC CEs).*

*- Assistance information from RAN to CN*

*Proposal 8: Exposure of RAN status to CN and UE upper layers should be considered for XR capacity improvement*

*Proposal 9: RAN2 should investigate the following RAN status information to be exposed to CN (XR application server) and/or UE (XR application) – reusing the framework defined for the RAN-assisted codec adaptation*

*- Preferred arrival time for a given PDU set (e.g. I frames)*

*- Load situation in RAN*

*- Preferred data rate/Codec modes*

[R2-2212637](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212637.zip) Enhancement on CG for XR-specific capacity improvement CMCC discussion Rel-18 FS\_NR\_XR\_enh

*Proposal 1: CG scheduling to be used for UL pose/control information.*

*Proposal 2: CG scheduling to be used for UL AR traffic jointly with DG.*

*Proposal 3: Multiple PUSCH occasions in a CG period is useful for UL AR traffic.*

*Proposal 4: Support joint activation of multiple CG configurations.*

*Proposal 5: CG periodicities require enhancement to align with UL AR traffic periodicities*

*Proposal 6: Retransmission-less CG configuration could be studied for better system capacity and better UE power saving.*

[R2-2211183](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211183.zip) Scheduling enhancements for capacity improvement Qualcomm Incorporated discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211276](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211276.zip) CG scheduling enhancements for XR Dell Technologies discussion FS\_NR\_XR\_enh

[R2-2211384](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211384.zip) Scheduling enhancements for XR traffic Intel Corporation discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211442](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211442.zip) Further consideration on XR-specific capacity improvement CATT discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211497](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211497.zip) Discussion on scheduling enhancements XR-specific capacity improvements vivo discussion Rel-18 FS\_NR\_XR\_enh [R2-2209491](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2209491.zip)

[R2-2211592](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211592.zip) Discussing on XR-specific scheduling enhancements Xiaomi Communications discussion

[R2-2211717](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211717.zip) Configured Scheduling and UE-Assistance Information for XR Apple discussion FS\_NR\_XR\_enh

[R2-2211927](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211927.zip) Considerations on XR specific capacity improvements Sony discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211928](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211928.zip) UL Scheduling enhancement for XR traffic and evaluation results Sony discussion Rel-18 FS\_NR\_XR\_enh

[R2-2211952](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211952.zip) Discussion on SR configuration for XR uplink traffic transmission TCL Communication discussion Rel-18

[R2-2211961](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211961.zip) Discussion on scheduling enhancement OPPO discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212042](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212042.zip) Discussion of scheduling enhancement Lenovo discussion Rel-18

[R2-2212174](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212174.zip) Scheduling enhancement on XR Spreadtrum Communications discussion Rel-18

[R2-2212236](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212236.zip) UE assistance information for CG configuration at gNB NEC discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212319](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212319.zip) Scheduling enhancement for XR capacity MediaTek Inc. discussion Rel-18

[R2-2212333](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212333.zip) Scheduling Enhancement for XR Google Inc. discussion

[R2-2212477](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212477.zip) Discussion on scheduling enhancements InterDigital, Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212650](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212650.zip) Discussion on UE Assistance Information for CG configuration Samsung discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212788](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212788.zip) Discussion on XR-specific Scheduling enahancement LG Electronics Inc. discussion Rel-18 FS\_NR\_XR\_enh

[R2-2212002](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212002.zip) Discussion on scheduling enhancements NTT DOCOMO, INC. discussion Rel-18

## 8.14 Enhancement on NR QoE management and optimizations for diverse services

(NR\_QoE\_enh-Core; leading WG: RAN3; REL-18; WID: RP-221803)

Time budget: 0.5 TU

Tdoc Limitation: 2 tdocs

### 8.14.1 Organizational

Including LSs and any rapporteur inputs (e.g. work plan

[R2-2211162](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211162.zip) LS on RAN visible QoE value (R3-226014; contact: Huawei) RAN3 LS in Rel-18 NR\_QoE\_enh-Core To:SA4 Cc:RAN2

* Noted (RAN2 only in CC with no actions)

Online (Tuesday) (1)

[R2-2211166](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211166.zip) LS on including QoS flow information in the RAN visible QoE report over Uu (R3-226062; contact: Huawei) RAN3 LS in Rel-18 NR\_QoE\_enh-Core To:RAN2 Cc:SA4, CT1

* Can be taken into account when creating the CRs
* Noted

Online (Tuesday) (1)

[R2-2212932](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212932.zip) Revised Work plan for Rel-18 NR QoE Enhancement China Unicom Work Plan Rel-18 NR\_QoE-Core

* Endorsed

Post-meeting email discussions

* Start drafting 38.300 running CR based on online agreements in this and previous meetings in post-meeting email discussion (short, China Unicom)

### 8.14.2 QoE measurements in RRC\_IDLE INACTIVE

including discussion on RRC configuration of QoE measurements in RRC\_IDLE/INACTIVE for MBS broadcast services, e.g. how can the configuration be given, how does gNB know which UEs can be configured, how is the area scope handled, how long does UE retain the QoE configuration in IDLE/INACTIVE, what are the UE memory requirements for MBS QoE reporting, etc.

Online (Tuesday) (5)

[R2-2212938](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212938.zip) Discussion on QoE measurements in RRC\_IDLE and INACTIVE states China Unicom discussion Rel-18 NR\_QoE-Core [R2-2210754](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2210754.zip)

* Focus on P3-4, P6

*Proposal 1: In Rel-18 NR QoE, Only UE that are capable of performing QoE measurements and reporting at least in connected state are considered.*

*Proposal 2: RAN2 needs to discuss whether gNB is allowed to configure QoE configuration for MBS broadcast service when the UE is in RRC\_IDLE and INACTIVE state.*

*Proposal 3: The gNB should forward the area scope information to the UE, RAN2 can further discuss how and when the gNB send the area scope information, e.g. during state transition procedure.*

*Proposal 4: RAN2 discuss whether UE AS layer or APP layer handle the area scope.*

*Proposal 5: RAN2 discuss how long UE shall keep the QoE configuration for MBS broadcast service.*

*Proposal 6: For buffering of QoE reports generated in RRC IDLE/INACTIVE state, RAN2 should make some assumptions on the minimal memory size requirement and the buffering layer, e.g. 64KB for AS layer buffer, the final decision can be made by SA4/SA5.*

*Proposal 7: UE cannot setup/resume RRC connection just for QoE reporting. UE only reports the INACTIVE/IDLE QoE reports to gNB when the UE has entered to the RRC\_CONNECTED due to other reasons.*

*Proposal 8: RAN2 can discuss the QoE measurements availability indication design before the UE reports the INACTIVE/IDLE QoE reports to gNB, e.g. 1-bit indication.*

P3

- Lenovo is not clear on RAN3 discusion motivation. Currently it’s mandatory present and everything is up to network. Does RAN3 intend to not include the area scope information in Rel-18? Wht is the expected UE behaviour on AS layer? Ericsson thinks the location filter in application layer has never been used. Application doesn’t know the cell.

- Huawei thinks this was discussed in Rel-17 already and SA4 told us the filter exists. Earlier network handled the information, now UE has to be aware of the area. We may need an LS to SA4 to clarify. Nokia thinks there are two different areas: Legacy method of geo-coordinates that application layer doesn’t know, and now RAN3-triggered area scope. QC thinks application layer can know the cell ID. Can also check with SA4.

- China Unicom thinks this came from RAN3 agreements. Huawei thinks RAN3 agreed it’s up to RAN2 to decide whether it’s AS or application layer who gives the configuration. In Rel-17 the measurements continue even if UE leaves the area scope. Samsung thinks that if we introcude AS-layer area scope, we need UE behaviour. With NAS we have less to do.

* Ask SA4 if we can use application layer information for QoE measurements in IDLE/INACTIVE the Rel-18 area scope given that the needed information requires cell knowledge.
* 6: For buffering of QoE reports generated in RRC IDLE/INACTIVE state, RAN2 will make some assumptions on the minimal memory size requirement and the buffering layer. We can indicate these to SA4/SA5 to see if they think those assumptions are realistic.

[R2-2212635](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212635.zip) Consideration on QoE measurement in RRC\_IDLE and RRC\_INATIVE CMCC discussion Rel-18 NR\_QoE\_enh-Core

* Focus on P1, P4-5

*Proposal 1: Introduce UE capability for performing QMC in RRC\_IDLE and RRC\_INACTIVE.*

*Proposal 2: RAN2 should ask the opinion of RAN3 and SA4/SA5 on the requirement about configuration QMC in RRC\_IDLE and RRC\_INACTIVE.*

*Proposal 3: RAN2 is kindly asked to agree that the 64KiB AS layer memory can be reused for buffering QoE report generated in RRC\_IDLE and RRC\_INACTIVE, and ask SA4/SA5 opinion on such memory is sufficient or not.*

*Proposal 4: Introduce valid time or similar parameter for QoE report generated in RRC\_IDLE and RRC\_INACTIVE.*

*Proposal 5: RAN2 is kindly asked to discuss whether UE should send QoE report as full text or abstract when UE enters RRC\_CONNECTED.*

P1

- CU wonders if this could be just one UE capability?

P4

- Lenovo wonders what does “outdated” mean? Since these ere used for offline processing, how are they obsoleted? For logged MDT we specified how long UE keep sthe measurements, is this the same? CMCC thinks the architecture is the same as in SON/MDT. Latest data is more valuable. CU wonders if the validity time is needed for INACTIVE? NW knows the existence of the configuration anyway.

- ZTE thinks we could check SA4 first on validity time requirement.

* Ask SA4/5 on how network would handle reports based on when they were collected, and whether it matters how “old” they are.

P5

- CU wonders what abstract is? Indication to network or something else? CMCC clarifies it’s e.g. service type for QoE.

[R2-2212795](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212795.zip) Disucssion on QoE measurements in RRC\_IDLE and RRC\_INACTIVE China Telecom discussion

* Focus on P1-2

*Proposal 1: The QoE configuration received in RRC connected state can be used in all RRC state.*

*Proposal 2: UE can only report the IDLE/INACTIVE QoE reports when it moves to RRC\_CONNECTED state due to other reasons.*

*Proposal 3: The QoE reports generated in RRC IDLE/INACTIVE state can be buffered in AS layer with 64KB buffer size. If the QoE reports exceed 64KB, RAN2 can discuss the following two alternatives:*

*• Alt 1: AS layer discards the QoE data*

*• Alt 2: APP layer is responsible for storing the QoE data*

P1

- Ericsson thinks configuration is in CONNECTED but there could be different configurations for each state. MTK agrees. ZTE agrees and thinks this is one of the options. Huawei thinks UE could receive configuration via MBS so it makes sense that UE can do it in all RRC states.

- CATT thinks UE may not keep all information in IDLE/INACTIVE.

ZTE thinks we should consider reporting in SDT as well.

Samsung thinks even in SDT is the same as we defined in legacy.

Nokia thinks we should consider memory constraints, but NW could control whether the UE is allowed to resume.

* 1: UE can be configured to do QoE measurements for MBS broadcast in all RRC states.

**As a baseline, UE does not tigger RRC Resume – RRC Setup just for the sake of reporting QoE. FFS whether there are cases where we deviate from this baseline.**

[R2-2211800](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211800.zip) QoE collection for IDLE and Inactive state Qualcomm Incorporated discussion NR\_QoE\_enh

* Focus on P1, P3, P5, P15

*For QoE configuration,*

*Observation 1: For m-based QoE, the gNB cannot release QoE configuration explicitly to the IDLE state UEs.*

*Observation 2: When the UE is released to IDLE state, the RRC ID introduced in Rel-17 is invalid any more.*

*For QoE configuration,*

*Proposal 1: RAN2 discusses whether IDLE and Inactive state UEs can be paged to enter CONNECTED state to receive QoE configuration, including adding new QoE configuration and release existing QoE configuration.*

*Proposal 2: gNB can determine whether to send QoE configuration to the CONNECTED UEs based on MBSInterestIndication message.*

*Proposal 3: An area scope can be provided to UE for the dedicated QoE configuration, and UE considers the QoE configuration is valid within the area scope.*

*Proposal 4: RAN2 discusses which layer (AS layer or application layer) checks the area scope.*

*Proposal 5: Introduce timer-based QoE configuration release, at least for IDLE state UEs configured with m-based QoE.*

*Proposal 6: Use RRCReconfiguration message to provide QoE configuration to UE. It is FFS whether to use RRCRelease message to provide QoE configurations which are only used for IDLE and Inactive state.*

*Proposal 7: The QoE configuration contains service type, QoE configuration container, QoE reference. It is FFS for other information.*

*Proposal 8: Ask SA5 whether QoE configurations may be different for different broadcast services.*

*QoE collection and reporting*

*Proposal 9: The QoE measurements collected in IDLE and Inactive state can be buffered in AS layer with reusing the 64KB buffer size defined for CONNECTED state in Rel-17.*

*Proposal 10: If the AS layer buffer (64KB) is full, RAN2 discusses the following alternatives:*

*Alt 1: The AS layer should discard the QoE data.*

*Alt 2: The QoE data should be buffered in application layer.*

*Proposal 11: QoE data reporting should not trigger RRC connection establishment or resume.*

*Proposal 12: Reuse existing MeasurementReportAppLayer and SRB4 to transmit QoE data collected in IDLE and Inactive state.*

*Proposal 13: UE AS layer indicates MCE information (e.g. MCE ID) for each reported QoE container to the gNB, and gNB forwards the QoE data to the appropriate MCE based on the MCE information.*

*Proposal 14: If application layer cannot provide MCE information (e.g. MCE address or MCE ID) to AS layer, gNB should configure MCE information to UE in the QoE configuration*

*n.*

*RVQoE collection in IDLE and Inactive state,*

*Proposal 15: It is proposed to clarify whether RVQoE measurement collection is needed in IDLE and Inactive state.*

[R2-2212192](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212192.zip) Discussion on QoE measurements for MBS broadcast services Huawei, HiSilicon discussion Rel-18 NR\_QoE\_enh-Core

*MBS broadcast QoE configuration*

*Observation 1: Only a limited number of UEs receiving MBS broadcast service needs to be configured for QoE measurements for the network to obtain a good representation of the service quality in a specific area.*

*Observation 2: There are numerous aspects and issues which would have to be resolved in order to support QoE configuration via broadcast, i.e. signalling details, UE procedures, signaling overhead issues, impact to MBS UEs and MBS performance, coordination between dedicated and common configurations etc.*

*QoE measurements reporting*

*Observation 3: Resuming/setting up an RRC connection just for the sake of reporting QoE brings no benefits while it causes MBS broadcast service performance deterioration, increases signaling overhead, impacts UE battery life and brings additional complexity.*

*Selection of the UEs for MBS broadcast QoE configuration*

*Observation 4: Forcing the gNB to utilize blind configuration of MBS broadcast QoE to all MBS capable UEs is sub-optimal for both the UE and the network in terms of signaling overhead, memory/storage requirements, predictability of receiving QoE measurements etc.*

*Area scope handling*

*Observation 5: SA4 specifications already provide a readily available solution for handling QoE measurement area scope for MBS broadcast services.*

*Storing of QoE reports in RRC IDLE/INACTIVE*

*Observation 6: The memory requirements for storing QoE reports generated for MBS broadcast in RRC\_IDLE/INACTIVE states will be much higher than in case of pause due to RAN overload.*

*Observation 7: The SA4 mechanism for QoE collection for MBS broadcast is unclear and it is unclear what are SA4 assumptions on storing the QoE reports for MBS broadcast.*

*MBS broadcast QoE configuration*

*Proposal 1: QoE measurements for MBS broadcast are configured to the UE via RRC Reconfiguration message.*

*Proposal 2: QoE measurement configuration via broadcast signaling (e.g. System Information, MCCH/MTCH etc.) is not supported.*

*Proposal 3: When the UE goes into RRC\_IDLE, the UE AS layer stores QoE configuration for MBS broadcast (except for QoE container).*

*Proposal 4: When the UE goes into RRC\_IDLE, the application layer stores QoE configuration for MBS broadcast and continues QoE measurements (if already ongoing), since it is not notified by the UE to release the QoE configuration.*

*Proposal 5: Timer based QoE configuration release is not supported, i.e. the UE stores the IDLE/INACTIVE QoE configuration until it is released by the network.*

*QoE measurements continuity*

*Proposal 6: It should be possible for the UE to continue the MBS broadcast QoE measurements for a particular QoE measurement session after the UE changes its RRC state.*

*QoE measurements reporting*

*Proposal 7: The UE does not setup/resume RRC connection just for QoE reporting, i.e. the QoE reports are sent to the network when the UE moves to RRC\_CONNECTED state due to other reasons.*

*Proposal 8: If the UE is in RRC\_Connected and receives QoE report for MBS broadcast from application layer, the UE sends the report according to QoE reporting procedure from Rel-17, i.e. the report is not stored but sent immediately (unless paused).*

*Selection of the UEs for MBS broadcast QoE configuration*

*Proposal 9: RAN2 should investigate the means for the gNB to identify which UEs should be provided with MBS broadcast QoE configuration for a specific MBS session via, e.g.:*

*1. Allowing the network to indicate to the UE the IDs of MBS broadcast sessions for which it is interested in receiving QoE measurements.*

*2. The UE indicating to the network when the UE is configured with or receiving/starting to receive the indicated MBS sessions.*

*Area scope handling*

*Proposal 10: Area scope verification for QoE collection for MBS broadcast should be performed by application layer. Send an LS to SA4 informing about RAN2 assumption.*

*Storing of QoE reports in RRC IDLE/INACTIVE*

*Proposal 11: Send an LS to SA4 asking to clarify the following aspects:*

*1. Whether SA4 plans to discuss storing of QoE reports generated for MBS broadcast while the UE is in RRC\_IDLE/INACTIVE state.*

*2. What is SA4 view on the memory requirements for storing QoE reports for MBS broadcast, e.g. depending on the service delivered via MBS broadcast or considering that the MBS broadcast service may be provided fully in RRC\_IDLE/INACTIVE state.*

[R2-2211450](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211450.zip) Discussion on QoE measurement in RRC\_IDLE and RRC\_INACTIVE Samsung discussion Rel-18

[R2-2211713](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211713.zip) Discussions on QoE Measurements in IDLE/INACTIVE States Apple discussion NR\_QoE\_enh-Core

[R2-2212008](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212008.zip) Discussion on QoE measurement in IDLE and INACTIVE state CATT discussion Rel-18 NR\_QoE\_enh-Core

[R2-2212288](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212288.zip) Discussion on QoE measurement in IDLE and INACTIVE ZTE Corporation, Sanechips discussion Rel-18 NR\_QoE\_enh-Core

[R2-2212457](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212457.zip) QMC enhancements for NR MBS Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_QoE\_enh-Core Late

[R2-2212458](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212458.zip) Discussion on support of QoE measurements in RRC\_IDLE and RRC\_INACTIVE Lenovo discussion Rel-18 NR\_QoE\_enh-Core

[R2-2212465](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212465.zip) QoE configuration and reporting for RRC\_INACTIVE and RRC\_IDLE states Ericsson discussion Rel-18 NR\_QoE\_enh-Core

*(moved from 8.14.4)*

### 8.14.3 Rel-17 leftover topics for QoE

Including discussion on Rel-17 leftover topics as agreed in RAN2#119bis-e.

This agenda item will not be treated in this meeting.

### 8.14.4 Support of QoE measurements for NR-DC

Including discussion on support of QoE measurements for NR-DC, e.g. MN-SN coordination, bearer handling for SN QoE reporting, etc.

Online (Tuesday) (2)

[R2-2211451](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211451.zip) Discussion on QoE measurement for NR-DC Samsung discussion Rel-18

*Proposal 1. For QoE reporting towards SN (i.e., SN RRC) directly, a new SRB (i.e., SRB5) is defined, which has low priority than SRB3.*

*Proposal 2. For QoE reporting towards MN (i.e., MN RRC), SRB4 is used. Split SRB4 is not introduced.*

*Proposal 3. Introduce an explicit indication in RRC QoE configuration for switching reporting leg.*

*Proposal 4. Discuss whether reporting leg 1) is common for all QoE configurations in UE, 2) can be different per QoE configuration (i.e., per measConfigAppLayerId).*

[R2-2212940](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212940.zip) Discussion on QoE configuration and reporting for NR-DC China Unicom discussion Rel-18 NR\_QoE-Core

*Proposal 1: For signalling-based QoE measurement, SRB1 is used for providing all the QoE configurations to UE from the gNB.*

*Proposal 2: For management-based QoE measurement, the UE can receive SN configurations from the MN via SRB1, or receive SN configurations from the SN via SRB3.*

*Proposal 3: The UE can send QoE reports towards SN only via SRB4 or a new SRB with a same or lower priority than SRB4.*

*Proposal 4: The SN can send the RAN visible QoE configuration to the UE.*

*Proposal 5: PDU session information and QoS flow information included in the RVQoE report can be used to ensure the corresponding RVQoE measurement result sending to the associated MN or SN.*

[R2-2211714](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211714.zip) QoE Reporting in NR-DC Apple discussion NR\_QoE\_enh-Core

[R2-2211805](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2211805.zip) RAN2 issues to support QoE collection in NR-DC Qualcomm Incorporated discussion NR\_QoE\_enh

[R2-2212009](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212009.zip) Discussion on QoE measurement in NR-DC CATT discussion Rel-18 NR\_QoE\_enh-Core

[R2-2212193](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212193.zip) Discussion on QoE measurements in NR-DC Huawei, HiSilicon discussion Rel-18 NR\_QoE\_enh-Core

[R2-2212289](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212289.zip) Discussion on QoE measurement for NR-DC ZTE Corporation, Sanechips discussion Rel-18 NR\_QoE\_enh-Core

[R2-2212456](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212456.zip) QMC support on NR-DC Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_QoE\_enh-Core Late

[R2-2212459](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212459.zip) Discussion on support of QoE measurements for NR-DC Lenovo discussion Rel-18 NR\_QoE\_enh-Core Late

[R2-2212754](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212754.zip) QoE reporting continuity in NR-DC LG Electronics Inc. discussion Rel-18

[R2-2212466](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212466.zip) QoE measurements in NR-DC Ericsson discussion Rel-18 NR\_QoE\_enh-Core

*(moved from 8.14.2)*

### 8.14.5 Other topics

Including any other QoE enhancement discussion (e.g. service type aspects, QoE continuity).

This agenda item will be deprioritized in this meeting.

IF time allows: Online (Tuesday) (1)

[R2-2212855](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_120\R2-2212855.zip) Recommended bitrate for XR services MediaTek Inc. discussion Rel-18

## 8.17 Dual Transmission/Reception (Tx/Rx) Multi-SIM for NR

(NR\_DualTxRx\_MUSIM-Core; leading WG: RAN2; REL-18; WID: RP-220955)

Time budget: 0 TU

Tdoc Limitation: 0 tdocs

This agenda item will not be treated in this meeting.

Note that the email discussion [Post119bis-e][212][MUSIM] Rel-18 MUSIM solutions (Qualcomm/vivo) will only start after RAN2#120, and is expected to be handled in RAN2#121 or RAN2#121bis-e.