**3GPP TSG-RAN WG4 Meeting # 112 R4-2412805**

Maastricht, Netherlands, 19th – 23rd August, 2024

**Agenda item:** 5.1

**Source:** Moderator (Huawei)

**Title:** Topic summary for [112][103] R18\_UERF\_maintenance\_Part2

**Document for:** Information

# Introduction

This agenda item (AI 5.20.1, 5.21.1, 5.22.1, 5.34.1 and 5.35) will handle all contributions for the maintenance of Multi-carrier enhancements for NR, Further NR coverage enhancements, NR sidelink evolution, Other Rel-18 non-spectrum related WIs and Rel-18 TEI RF part with the following sub-topics.

1. The maintenance of Rel-18 Multi-carrier enhancements for NR
2. The maintenance of Rel-18 Further NR coverage enhancements
3. The maintenance of NR sidelink evolution
4. Other Rel-18 non-spectrum related WIs
5. Rel-18 TEI RF part

It is planned to collect the comments related to CRs, LS and draft CRs in NMW (<https://nwm-trial.etsi.org/#/documents/8915> ) before the NWM work deadline, and the final decision will be made online.

Based on Chairman’s guidelines, the following contributions/proposals are moved and treated in this thread.

Move R4-2412784/3064 from AI 4.8 to AI 5.35 and treat them in [103].

Move R4-2412517/18 from AI 5.21.1 to 5.24.1 and treat them in [207]

For TEI, the following tdocs will be treated in this topic thread:

R4-2412090, R4-2412091, R4-2412445, R4-2412450, R4-2412461, R4-2412536, R4-2412537, R4-2412598, R4-2412606, R4-2413227, R4-2413355.

Treat R4-2412440/43/44 in this thread.
Treat R4-2413129 in [103]

# Topic #1: The maintenance of Rel-18 Multi-carrier enhancements for NR

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2412101**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412101.zip) | vivo | **Some remaining issues of Multi-carrier enhancements****Observation 1:** Currently new RRC signalling *switchingPeriodConfigForBandPair* did not consider new capability 38-6 and applied to more cases than fallback.**Observation 2:** More problems for consistency and overwriting may happen in current scheme.**Proposal 1:** Discuss this issue, and see if some actions in RAN4 and/or feedback is needed for RAN2 via LS.**Observation 3:** Currently the requirements for some 4 band cases are not explicitly defined.**Proposal 2:** Discuss whether and how to cope with 4 band requirements. |
| [**R4-2412538**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412538.zip) | Huawei, HiSilicon | Corrections on the feature list of Rel-18 Tx switching*Proposal 1: We propose the following change to FG38-3 and FG38-4.*C:\Users\z00471447\AppData\Roaming\eSpace_Desktop\UserData\z00471447\imagefiles\originalImgfiles\D094263D-C316-4A49-B1FC-78FA006A0EE8.png |
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## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1 Remaining issues of Multi-carrier enhancements

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 1-1-1:**

* **Proposal: Discuss this issue, and see if some actions in RAN4 and/or feedback is needed for RAN2 via LS.**
	+ **Observation 1: Currently new RRC signalling *switchingPeriodConfigForBandPair* did not consider new capability 38-6 and applied to more cases than fallback.**
	+ **Observation 2: More problems for consistency and overwriting may happen in current scheme.**

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| ***UplinkTxSwitchingBandPairConfig* field descriptions** |
| ***bandInfoUL1, bandInfoUL2***Indicates the band index for a band pair. The value n indicates the band included at the n-th entry of *uplinkTxSwitchingBandList*. |
| ***switching2T-Mode***Indicates 2Tx-2Tx switching mode is configured to the band pair.If this field is absent when uplink Tx switching is configured, it is interpreted that 1Tx-2Tx/1Tx-1Tx UL Tx switching is configured as specified in TS 38.214 [19]. |
| ***switchingOptionConfigForBandPair***Indicates the switching option for the band pair as specified in TS 38.214 [19], clause 6.1.6. |
| ***switchingPeriodConfigForBandPair***Indicates the value of switching period for the band pair as specified in TS 38.214 [19], clause 6.1.6. Value *n35us* represents 35 us, *n140us* represents 140us. If the field is absent, 210 us is applied. |

* Recommended WF
	+ RAN4 can discuss whether there is an issue for the RRC signalling design.

**NTT DOCOMO: in our opinion, we do not need LS to RAN2. There are reasons for RAN2 to define the generic spec.**

**Huawei: We share the similar view. We do not see the issue.**

**Issue 1-1-2:**

* **Proposal: Discuss whether and how to cope with 4 band requirements.**
	+ **Observation 3: Currently the requirements for some 4 band cases are not explicitly defined.**



**LS R4-2220548:**



* Recommended WF
	+ As the spec wordings were captured into the following agreed CR R4-2319110, RAN4 can clarify which is the latest agreement, CR R4-2319110 or LS R4-2220548. Then RAN4 can decide whether to open the discussion as proposed.

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| [**R4-2319110**](file:///D%3A%5CRAN4%23109%5CDocs%5CR4-2319110.zip) **CR for 38.101-1: Time mask for switching across three or four uplink bands** *Type: CR For: Agreement 38.101-1 v18.3.0 CR-1876 rev Cat: B (Rel-18) Source: China Telecom, Huawei, Hisilicon, CMCC, Xiaomi, China Unicom, vivo, CATT, ZTE***Abstract:** Re-submission of the CR [R4-2317608](file:///D%3A%5CRAN4%23109%5CDocs%5CR4-2317608.zip) endorsed in RAN4#108bis**Decision: Agreed.** |

### Sub-topic 1-2 the corrections for the feature list of Rel-18 Tx switching

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 1-2-1:**

* **Proposal:**
	+ **We propose the following change to FG38-3 and FG38-4.**

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| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 38. NR\_MC\_enh  | 38-3  | Switching Period for unaffected Band for Dual UL | SwitchingPeriodUnaffectedBandDualUL indicate for a given band pair {band X and band Y}, whether/how the switching period is to be applied on band X, Y, Z, when a UL Tx switching is triggered from band pa ir {band X and band Z} to band pair {band Y and band Z}, as defined in 38.101-1. If absent for band Z, the UE is not required to transmit on any UL bands during the switching period reported for the band pair of band X and band Y, as defined in 38.101-1-      maintainedUL-Trans-r18 indicates that the UE is capable of uplink transmission on band Z and is not required to transmit on band X and Y during the switching period reported for the band pair of band X and band Y, as specified in 38.101-1.  -      periodOnULBands-r18 indicates the switching period to be applied on any UL bands as specified in 38.101-1. n35us represents 35 us, n140us represents 140us, and n210us represents 210us. -      Band Z corresponds to the zth entry in the uplinkTxSwitchingPeriodUnaffectedBandDualUL-List-r18, which includes the UL band of this band combination excluding band X and band Y listed in the same order of the band combination. | 38-1 | Yes  | N/A  | UL Tx switching with unaffected band(s) involved cannot be supported in the band combination | Per BC | No | FR1 only  | Support mixture of FDD/TDD  |  Component 3 candidate value: {35us, 140 us, 210us} | Optional with capability signaling  |
| 38. NR\_MC\_enh  | 38-4 | Additional switching Period for switching case across three or four bands for Dual UL | 0. Indicate additionally the supported Tx switching period for switching case across three or four band, when Rel-18 UL Tx switching is configured by uplinkTxSwitchingMoreBands-r18. 1. If the capability is not reported, the switching period reported in switchingPeriodFor2T-r18 or switchingPeriodFor1T-r18 applies, as specified in TS 38.214 and TS 38.101-1. | 38-1 | Yes  | N/A  | The larger one of the switching period of the two band pairs applies.  | Per BC | No | FR1 only  | Support mixture of FDD/TDD  |  Component 1 candidate value: {35us, 140 us, 210us} | Optional with capability signaling  |

* Recommended WF
	+ RAN4 can discuss whether the corrections for FG38-3 and FG38-4 are agreeable.

# Topic #2: The maintenance of Rel-18 Further NR coverage enhancements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411156**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411156.zip) | Apple | (NR\_cov\_enh2-Core) On remaining issues with Rel-18 coverage enhancement |
| [**R4-2411266**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411266.zip) | Apple | (NR\_cov\_enh2-Core) CR to 38.101-1: Clarification on receiver requirements for coverage enhancement |
| [**R4-2411267**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411267.zip) | Apple | (NR\_cov\_enh2-Core) CR to 38.101-3: Clarification on receiver requirements for coverage enhancement |
| [**R4-2411889**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411889.zip) | ZTE Corporation, Sanechips | CR on 38.101-1 Update the IE names for coverage enhancement |
| [**R4-2412990**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412990.zip) | Ericsson, Qualcomm, Intel | (NR\_cov\_enh2-Core) CR to 38.101-3 for powerr boosting feature supporting CA |
| [**R4-2412991**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412991.zip) | Ericsson, Qualcomm, Intel, Huawei | (NR\_cov\_enh2-Core) CR to 38.101-1 for power boosting feature supporting CA |
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## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1 Remaining issues with Rel-18 coverage enhancement

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 2-1-1:**

During RAN4#111 it was agreed that no new MSD test cases shall be introduced for Rel-18 power boosting.



* **Proposal: Capture the RAN4 agreement on receiver requirements and testing by agreeing the CRs for TS 38.101-1 and 38.101-3.**

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| 7.1 GeneralUnless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).[…]Unless otherwise stated, the receiver requirements of single carrier or CA operation are applicable to UE with one Tx antenna connector or multiple Tx antenna connectors with UL MIMO or Tx diversity operation in the UL band(s).Unless otherwise stated, the receiver requirements of single carrier or CA operation are not applicable if ΔPPowerBoost assumes a positive value. |

* Recommended WF
	+ RAN4 can discuss whether the wordings can be revised or not.
	+ If it’s agreeable, the corresponding CRs R4-2411266 and R4-2411267 can be agreeable.

**Issue 2-1-2:**

During RAN4#111 the following two issues were identified.



* **Proposal: It is proposed to set the feature as ‘per-FS’ and explicitly state in the comment part of the feature list that RAN4 intends a UE to be able to support different capabilities for parent and fallback combinations.**
	+ **Observation 1:** RAN2 does not currently have a dedicated signalling to inform the network of different capabilities with parent and fallback combinations. However, the handling different capabilities can be achieved by reporting fallback band combinations along with parent combinations.

### Sub-topic 2-2 CRs and TPs

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| **CR number** | **Comments collection** | **Recommendation** |
| [**R4-2411266**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411266.zip) | (NR\_cov\_enh2-Core) CR to 38.101-1: Clarification on receiver requirements for coverage enhancement (Apple) | **Revised** |
| Samsung (Tina) flag Apple R4-2411266/67- Actually increasing higher power limit feature has same situation (i.e., no new MSD are specified in addition to the ones for legacy power classes), but this is not reflected in spec. OK to add some wording for power boosting feature if it was already agreed in last meeting. But the wording may could be further discussed? One comment is the WF says "MSD" but the CR says "Rx requirements" |
| Nokia (Johannes) - R4-2411266/67We do not agree with the suggested wording. The WF states that "no new MSD test case are introduced" which is not the same as saying "receiver requirements are not applicable" |
| Qualcomm - Sumant Iyer: Understand the principle behind Apple CRs 266 and 267, but it does not seem necessary, because Tx powers are explicitly called out in MSD requirements. Would like to understand what is lost if the proposed wording is not added to the standard. |
| [**R4-2411267**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411267.zip) | (NR\_cov\_enh2-Core) CR to 38.101-3: Clarification on receiver requirements for coverage enhancement (Apple) | **Revised** |
| Samsung (Tina) flag Apple R4-2411266/67- Actually increasing higher power limit feature has same situation (i.e., no new MSD are specified in addition to the ones for legacy power classes), but this is not reflected in spec. OK to add some wording for power boosting feature if it was already agreed in last meeting. But the wording may could be further discussed? One comment is the WF says "MSD" but the CR says "Rx requirements" |
| Nokia (Johannes) - R4-2411266/67We do not agree with the suggested wording. The WF states that "no new MSD test case are introduced" which is not the same as saying "receiver requirements are not applicable" |
| Qualcomm - Sumant Iyer: Understand the principle behind Apple CRs 266 and 267, but it does not seem necessary, because Tx powers are explicitly called out in MSD requirements. Would like to understand what is lost if the proposed wording is not added to the standard. |
| [**R4-2411889**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411889.zip) | CR on 38.101-1 Update the IE names for coverage enhancement (ZTE) | **Agreeable** |
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| [**R4-2412990**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412990.zip) | (NR\_cov\_enh2-Core) CR to 38.101-3 for powerr boosting feature supporting CA (Ericsson, Qualcomm, Intel) | **Revised** |
| Nokia (Johannes) - R4-2411290/91In general OK but should the IE names not be updated? |
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| [**R4-2412991**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412990.zip) | (NR\_cov\_enh2-Core) CR to 38.101-1 for power boosting feature supporting CA (Ericsson, Qualcomm, Intel, Huawei) | **Revised** |
| Nokia (Johannes) - R4-2411290/91In general OK but should the IE names not be updated? |
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# Topic #3: The maintenance of NR sidelink evolution

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411079**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411079.zip) | CATT, CICTCI | CR for 38.101-1: Correction on the SL-U RB set and intra-cell guard band determination |
| [**R4-2412045**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412045.zip) | LG Electronics | CR on missing NS values for SL-U(R18) |
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## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1 CRs and TPs

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| **CR number** | **Comments collection** | **Recommendation** |
| [**R4-2411079**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411079.zip) | CR for 38.101-1: Correction on the SL-U RB set and intra-cell guard band determination (CATT, CICTCI) | **Agreeable** |
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| [**R4-2412045**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412045.zip) | CR on missing NS values for SL-U(R18) (LG Electronics) | **Agreeable** |
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# Topic #4: Other Rel-18 non-spectrum related WIs

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411660**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411660.zip) | Nokia |  [NR\_pos\_enh2-Core] CR to 38.101-1 on positioning IE correction |
| [**R4-2412481**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412481.zip) | Anritsu Limited |  (5G\_V2X\_NRSL-Core) CR to add third level clause suffixes for V2X - TS38.101-1 |
| [**R4-2413240**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413240.zip) | Huawei, HiSilicon, UIC | (LTE\_NR\_HPUE\_FWVM\_R18-Core) Clarification on FRMCS PC1 applicability for bands n100 and n101 |
| [**R4-2413245**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413245.zip) | Huawei, HiSilicon | Draft LS to ETSI TC RT on missing receiver characteristics of the n100/n101 HPUE cab-radio based on ECC(20)02 |
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## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 4-1 Draft LS to ETSI TC RT on missing receiver characteristics of the n100/n101 HPUE cab-radio based on ECC(20)02

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 4-1-1:**

* **Proposal: RAN4 can discuss whether the following LS can be approved or not.**



* Recommended WF
	+ RAN4 can discuss whether the following LS can be approved or not.

### Sub-topic 4-2 CRs and TPs

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| **CR number** | **Comments collection** | **Recommendation** |
| [**R4-2411660**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411660.zip) |  [NR\_pos\_enh2-Core] CR to 38.101-1 on positioning IE correction (Nokia) | **Agreeable** |
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| [**R4-2412481**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412481.zip) | (5G\_V2X\_NRSL-Core) CR to add third level clause suffixes for V2X - TS38.101-1 (Anritsu Limited) | **Revised** |
| QC R4-2412481 [Ville/Chan] Is there a reason not to do this for rel-17 too? |
| Anritsu R4-2412481 [Hassen] - Thanks Qualcomm, it is an error, it should be from Rel-17. I will request new TDoc numbers for Cat F (Rel-17) and A (Rel-18).R4-2412481 [Hassen] - Sorry, actually the changes apply only to Rel-18 not to Rel-17.There is no CA and no Shared spectrum channel access for V2X in Rel-17, they were added to TS 38.101-1 V18.4 based on R4- 2319932 following NR\_SL\_enh2-Core WI (Rel-18 - RP-232789). Unfortunately, I already asked a revision number so R4-2412481 will be revised a 2nd time.R4-2412481 [Hassen] - Actually, there will be no need for a revision. We can go back to the original TDoc (R4-2412481) while the revised TDoc is withdrawn, as probably all of you thought when you read my previous post.Sorry for the confusion... |
| [**R4-2413240**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413240.zip) |  (LTE\_NR\_HPUE\_FWVM\_R18-Core) Clarification on FRMCS PC1 applicability for bands n100 and n101 (Huawei, HiSilicon, UIC) | **Agreeable** |
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| [**R4-2413245**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413245.zip) | Draft LS to ETSI TC RT on missing receiver characteristics of the n100/n101 HPUE cab-radio based on ECC(20)02 (Huawei, HiSilicon) | **Revised** |
| R4-2413245 [UIC - Dick] this version is not based on the latest draft from RAN#111 Fukuoka R4-241072. Please remove "In case ETSI TC RT would prefer 3GPP RAN WG4 to handle the above mentioned PC1 cab‑radio Rx characteristics in TS 38.104/TS 38.141-1 specifications, it is advised to explicitly inform 3GPP RAN WG4 via LS". |
| R4-2413245 [Huawei, Michal]: agree with UIC comments as discussed offline. To align with R4-241072 the commented sentence is to be removed. |
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# Topic #5: Rel-18 TEI

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2412090**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412090.zip) | vivo | CR on 38.101-1 for cleanup of Delta\_powerclass related requirements for HPUE |
| [**R4-2412091**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412091.zip) | vivo | CR on 38.101-3 for cleanup of Delta\_powerclass related requirements for HPUE |
| [**R4-2413129**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413129.zip) | Qualcomm Inc. | (NR\_NTN\_solutions-Core) CR to TS 38.101-5: variable duplex distance |
| [**R4-2412440**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412440.zip) | Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks | (NR\_NTN\_solutions-Core) CR to 38.101-5 Flexible TX-RX Separation for NR NTN Bands from Rel-18 |
| [**R4-2412443**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412443.zip) | Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks | (NR\_NTN\_solutions-Core) CR to 38.101-5 Flexible TX-RX Separation for NR NTN Bands from Rel-17  |
| [**R4-2412445**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412445.zip) | Inmarsat, Viasat | (LTE\_NBIoT\_eMTC\_NTN\_req-Core) CR to 36.102 In-band NB-IoT NTN deployment with NR  |
| [**R4-2412450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412450.zip) | Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks | (LTE\_NBIoT\_eMTC\_NTN\_req-Core) CR to 36.108 In-band NB-IoT NTN deployment with NR  |
| [**R4-2412461**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412461.zip) | Inmarsat, Viasat | Essential correction to NB-IoT NTN Carrier Frequency to avoid breaking of forward and backward compatibility |
| [**R4-2412536**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412536.zip) | Huawei, HiSilicon | Discussion on the channel spacing for intra-band EN-DC |
| [**R4-2412606**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412606.zip) | Huawei, HiSilicon | (TEI18) R18 Cat-F CR 38.101-3 channel spacing for intra-band EN-DC  |
| [**R4-2413227**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413227.zip) | Qualcomm Incorporated | Discussion on feasibility of FR2 UEs with low EIRP |
| [**R4-2413355**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413355.zip) | Ericsson | (TEI18) CR to 38.101-1 Rel-18: Corrections of NR operating bands clause in FR1  |
| R4-2412784 | Huawei,HiSilicon | Discussion on introduction of new FR2 PC |
| R4-2413064 | Huawei,HiSilicon | CR on introduction of new FR2 power class 8 |

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1 channel spacing for intra-band EN-DC

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 5-1-1: New requirements for intra-band non-contiguous EN-DC with nominal channel spacing should be introduced in RAN4.**

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| Rationale:In R4-2407961, the applicable requirement issue was pointed out that ‘If the RAN4 were to enable the nominal channel spacing for non-contiguous EN-DC, the applicable requirements would need to be defined.’To avoid non-backward compatible issue, the requirements should be unchanged for intra-band contiguous EN-DC with nominal channel spacing and intra-band non-contiguous EN-DC with larger than nominal channel spacing. New requirements for intra-band non-contiguous EN-DC with nominal channel spacing should be introduced in RAN4. |

* **Proposal: Applicable requirements for intra-band non-contiguous EN-DC with nominal channel spacing should be introduced in RAN4.**

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| For intra-band non-contiguous EN-DC with nominal channel spacing, the channel spacing between E-UTRA and NR carriers shall be equal to or larger than the nominal channel spacing defined in this clause when UE indicating [*intraBandENDC-NominalSpacing*].. |

* Recommended WF
	+ RAN4 can discuss whether the wordings can be revised or not. The companied CR is R4-2412606.

### Sub-topic 5-2 feasibility of FR2 UEs with low EIRP

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 5-2-1: To introduce new FR2 power class**

* **Option 1: RAN4 to clearly define use case, throughput targets and deployment conditions to support a new UE power class, so companies may study further.**
	+ **Observation 1: High UL throughput is not compatible with low EIRP**
	+ **Observation 2: A goal to maintain low complexity is not compatible with enhanced baseband capabilities like wide channel BW support, CA support and UL MIMO support.**
	+ **Observation 3: Video surveillance in an urban micro setting requires considerably higher EIRP than what is guaranteed by PC7 (FR2 Redcap).**
	+ **Observation 4: Most reasonable expectations of indoor only UEs can be met by PC7 (FR2 RedCap).**
* **Option 2: Introduce the new power class based on the proposals 1, 2 and 3 with specification of the requirements as shown in Table 1.**
	+ **Observation 1: It’s essential to introduce the new power class into 3GPP by the end of 2024, given that local industry standard targets for the completion by the end of 2024 to facilitate the FR2 industry development.**
	+ **Proposal 1: Some PC7 requirements can be applied for this new FR2 power class.**
	+ **Proposal 2: New RF requirements shall cover 200MHz and 400MHz channel bandwidth for single carrier operation. Note that targeted bands are n257, n258 and n261.**
	+ **Proposal 3: Specify new RF requirements for CA and UL-MIMO for this new FR2 power class.**

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| **Section** | **Requirements for PC8** | **Comments** |
| 6.2.1.0 | General | Assumption of lower power non-RedCap UE types for new PC8 |
| 6.2.1.8 | UE maximum output power for power class 8 | The MOP specified in section 6.2.1.7 for PC7 applies. |
| 6.2.2.8 | UE maximum output power reduction for power class 8 | MPR specified in section 6.2.2.3 for PC3 FR2-1 applies. |
| 6.2.3.3.8 | A-MPR for NS\_202 for power class 8 | A-MPR for NS\_202 specified in clause 6.2.3.3.3 for PC3 applies. |
| 6.2.3.4.8 | A-MPR for NS\_203 for power class 8 | A-MPR for NS\_203 specified in clause 6.2.3.4.3 for PC3 applies. |
| 6.2A.2.8 | Maximum output power reduction for power class 8 | MPR for PC3 specified in sub-clause 6.2A.2.4.1 for intra-band contiguous UL CA applies. |
| 6.2A.3.3.7 | A-MPR for CA\_NS\_202 for power class 8 | For intra-band contiguous CA, A-MPR for CA\_NS\_202 specified in sub-clause 6.2A.3.3.3 for PC3 applies. |
| 6.2A.3.4.7 | A-MPR for CA\_NS\_203 for power class 8 | For intra-band contiguous CA, AMPR specified in sub-clause 6.2A.3.4.3 for PC3 applies. |
| 6.2D.1.7 | UE maximum output power for UL MIMO for power class 8 | The MOP specified in section 6.2.1.7 for PC7 applies. |
| 6.2D.2.7 | UE maximum output power reduction for modulation / channel bandwidth for UL MIMO for power class 8 | MPR for PC3 specified in section 6.2.2.3 applies. |
| 6.2D.3.7 | UE maximum output power reduction with additional requirements for UL MIMO for power class 8 | A-MPR for PC3 specified in section 6.2.3 applies. |
| 6.3.1.5 | Minimum output power for power class 8 | Specify requirements for 200MHz and 400MHz CBW on top of requirements in clause 6.3.1.4 for PC7 |
| 6.3A.1.4 | Minimum output power for CA for power class 8 | Min output power specified in clause 6.3A.1.3 for intra-band contiguous CA for PC3 with up to 400MHz applies.  |
| 6.3D.1.4 | Minimum output power for UL MIMO for power class 8 | Specify corresponding requirements based on new clause 6.3.1.5 |
| 6.4.2.1 | Error vector magnitude | EVM for PC3 in FR2-1 applies. |
| 6.4.2.2.9 | Carrier leakage for power class 8 | the relative carrier leakage power specified in subclause 6.4.2.2.4 for PC3 applies. |
| 6.4.2.3.9 | In-band emissions for power class 8 | The average of the in-band emission specified in subclause 6.4.2.3.4 for PC3 applies. |
| 6.4A.2.2.8 | Carrier leakage for CA for power class 8 | For intra-band contiguous carrier aggregation, the carrier leakage requirement specified in clause 6.4A.2.2.4 for PC3 in FR2-1 applies. |
| 6.4A.2.3.8 | Inband emissions for CA for power class 8 | For intra-band contiguous carrier aggregation, the average of the in-band emission specified in clause 6.4A.2.3.4 for PC3 applies. |
| 6.6.9 | Beam correspondence for power class 8 | Requirements specified in clause 6.6.8 for PC7 applies. |
| 7.3.2.8 | Reference sensitivity power level for power class 8 | Specify requirements for 200MHz and 400MHz CBW on top of requirements in clause 7.3.2.7 for PC7 |
| 7.3.4.8 | EIS spherical coverage for power class 8 | Specify requirements for 200MHz and 400MHz CBW on top of requirements in clause 7.3.4.7 for PC7 |

* Recommended WF
	+ RAN4 can discuss these proposals. The companied CR is R4-2413064.

### Sub-topic 5-3 Essential correction to NB-IoT NTN Carrier Frequency

*Sub-topic description: The companied CRs are R4-2412445 and R4-2412450.*

*Open issues and candidate options before f2f meeting:*

**Issue 5-3-1: Channel raster, carrier frequency and EARFCN issue for NB-IoT NTN.**

* **Proposal 1: Revert the FDL formula for Carrier Frequency for Cat NB1 and NB2 to the original formula aligned with TS 36.101 (terrestrial spec) as follows:**
	+ **FDL = FDL\_low + 0.1(NDL – NOffs-DL) + 0.0025\*(2MDL +1)**
* **Observation 1: The current formula for Carrier Frequency (FDL) and MDL value set for Cat NB1 and NB2 specified in TS 36.102 and TS 36.108 as part of Rel-18 WI break forward compatibility with in-band deployment and backwards compatibility with Terrestrial spec.**
* **Observation 2: The current Carrier Frequency and MDL value set specified in TS 36.102 and TS 36.108 prevent the introduction of in-band deployment support of NB-IoT NTN with NR NTN in the same SAN.**
* **Observation 3: Restoring forward support for in-band deployment with NR would likely require the introduction of a new set of MDL, thus rendering the solution adopted in R4-2220812 completely moot.**
* **Observation 4: This issue with forwards and backwards compatibility can have massive impact on upcoming deployments of NB-IoT NTN, and furthermore may break backwards compatibility with existing R17 based deployments and UE populations in the field, therefore it needs to be urgently fixed before R18 UE are being implemented, this may well be our last opportunity to fix it.**
* **Observation 5: Rel-17 NB-IoT implementations currently in the market are likely to be still based on previous pre-R17 releases (i.e. aligned with terrestrial R13-14 UE as per TS 36.101), due to the lack of an NB-IoT NTN UE RF spec in Release 17. Therefore the impact of this late change should be limited.**
* Recommended WF
	+ RAN4 can discuss the proposal.

**Issue 5-3-2: MDL non-anchor values**

* **Proposal 2: Adopt one of the solutions proposed in R4-2213243 and R4-2216637 and either change the MDL values for Standalone by introducing the additional MDL values or add a NOTE that introduces a 0.5 shift in MDL values for Standalone Non-Anchor carriers:**
	+ **Option 1: Introduce a new set of MDL as {-9.5, -8.5,-7.5, -6.5, -5.5, -4.5, -3.5, -2.5 -1.5, 0.5, 1.5, 2.5, 3.5, 4.5, 5.5, 6.5, 7.5, 8.5, 9.5}**
	+ **Option 2: NOTE 5: For the carrier not including NPSS/NSSS for stand-alone operation, MDL = MDL + 0.5.**
* Recommended WF
	+ RAN4 can discuss the proposal.

**Issue 5-3-3: Is it allowed to deploy the in-band and guard band operation for NB-IoT NTN?**

* **Proposal 3: Remove the restriction for in-band deployment by striking out NOTE1 as follows:**
	+ **NOTE 1:  ~~Guard-band operation and in-band operation for NB-IoT are not supported in this version of the specification.~~**
* Recommended WF
	+ RAN4 can discuss the proposal.

Qualcomm: there is proposed CR under AI. It is very difficult to discuss the individual change. Guard band should not be supported. For in-band operation, we have offline discussion. We try to enable it during the next quarter.

Inmarsat: we have some discussions on the possibility rather than changing the existing equation. As Qualcomm said, we need more time to clarify the changes and capabilities. We are OK to come back in future.

Huawei: Share the similar view as Qualcomm. We should have proper procedure to add the new feature to the existing spec. The current range of offset value is valid. It meets the standalone deployment target in the WID. There is misunderstanding of previous work in Inmarsat paper.

Ericsson: For in-band, there are also BS RF impact. In 38.104 TN side, we have in-band isolation and RF requirements for inband NB-IoT operation. That is also needed be considered.

Inmarsat: to Huawei, we correctly identify the design target. In Rel-18 the target is the standalone. When it was decided, it is claimed that the design should be future-proof.

Huawei: in TR, to support in-band, we should use the same offset but adjust formula. We design the formula for standalone mode, but adjust the equation for in-band. In TN design there is a lot of restriction. In NTN spec, we allow more flexibility.

**Issue 5-3-4: If it is allowed to do in-band operation for NB-IoT NTN, the following proposals can be considered.**

* **Proposal 4: Modify existing NOTE2 to NOTE4 as follows and change the value of MDL for carrier including NPSS/NSSS for stand-alone operation as follows, aligned with TS 36.101:**
	+ **NOTE ~~2~~4:  For the carrier including NPSS/NSSS for stand-alone operation, MDL = -0.5.**
* **Proposal 5: Introduce a new NOTE2 aligned with TS 36.101, and modified as follows:**
	+ **NOTE 2:  For FDD MDL = -0.5 is not applicable for in-band operation.**
* **Proposal 6: Introduce a new NOTE3, aligned with TS 36.101, and modified as follows:**
	+ **NOTE 3: For the carrier including NPSS/NSSS for in-band operation, MDL is selected from {-2,-1,0,1}.**
* Recommended WF
	+ RAN4 can discuss these proposals, if it is allowed to do in-band operation for NB-IoT NTN.

**Issue 5-3-5:**

* **Proposal 7: As a compromise, and if necessary, we can consider to keep the same MDL value restrictions for Anchor Carrier aligned for both Standalone and in-band.**
	+ **Observation 7: The additional MDL values {-2,-1,0,1,2} would allow alignment with NR NTN Enhanced Channel Raster and would provide more consistency with Terrestrial spec in TS 36.101**
* Recommended WF
	+ From moderator’s perspective, as there is no explanation on this proposal in the paper, more clarification is needed for the real intention of this proposal.

### Sub-topic 5-4 CRs and TPs

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| **CR number** | **Comments collection** | **Recommendation** |
| [**R4-2412090**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412090.zip) | CR on 38.101-1 for cleanup of Delta\_powerclass related requirements for HPUE (vivo) | Revised |
| Samsung (Tina) flag vivo R4-2412090 and R4-2412091, it is unclear to us why the change is from Rel-18 but not the earliest ones |
| Apple R4-2412090/R4-2412091 (James):If the duplicate texts would be removed, we prefer to remove the ones in the "UE maximum output power" section instead of the ones in "Configured transmitted power" section proposed in this CR as it would mistakenly double-count the power reduction (fall back to default power class plus delta PPowerClass) where the issue has been brought up in R4-2400180 in RAN #110 meeting. |
| [**R4-2412091**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412091.zip) | CR on 38.101-3 for cleanup of Delta\_powerclass related requirements for HPUE (vivo) | Revised |
| Samsung (Tina) flag vivo R4-2412090 and R4-2412091, it is unclear to us why the change is from Rel-18 but not the earliest ones |
| Apple R4-2412090/R4-2412091 (James):If the duplicate texts would be removed, we prefer to remove the ones in the "UE maximum output power" section instead of the ones in "Configured transmitted power" section proposed in this CR as it would mistakenly double-count the power reduction (fall back to default power class plus delta PPowerClass) where the issue has been brought up in R4-2400180 in RAN #110 meeting. |
| [**R4-2413129**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413129.zip) | (NR\_NTN\_solutions-Core) CR to TS 38.101-5: variable duplex distance (Qualcomm Inc.) | Return to (Need to discuss which CR will be revised, R4-2412443/2440 or R4-2413129) |
| Ericsson [D. Everaere] R4-2413129. The proposed wording of the note in Table 5.4.4-1 is a bit confusing. We would prefer the proposal made in R4-2412443 |
| Huawei R4-2413129(Henry)In clause 5.4.4, I think we just specify the default separation, but -87.5MHz is still allowed to be configured. We don't need two default separation.The correction in table 7.3.2-2 is enough. |
| Apple R4-2413129 (James):The CR can be merged to R4-2412443. The intention on variable duplex spacing would result in a range of duplex spacing instead of two fixed duplex spacings as proposed in this CR. Whether to define additional REFSENS test point can be further discussed. |
| [**R4-2412440**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412440.zip) | (NR\_NTN\_solutions-Core) CR to 38.101-5 Flexible TX-RX Separation for NR NTN Bands from Rel-18 (Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks) | Return to (Need to discuss which CR will be revised, R4-2412443/2440 or R4-2413129) |
| Huawei R4-2412440 and R4-2412443(Henry)Similar comments made for R4-2413129 apply. Also given that the table for frequency separation is for the deafult per band and RAN2 spec can allow to configure different separation with a UE, the range doesn’t have to be described. |
| Qualcomm (Toni) flag:R4-2412443/R4-2412440: further discussion needed between these and approach in R4-2413129 |
| [**R4-2412443**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412443.zip) | (NR\_NTN\_solutions-Core) CR to 38.101-5 Flexible TX-RX Separation for NR NTN Bands from Rel-17 (Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks) | Return to (Need to discuss which CR will be revised, R4-2412443/2440 or R4-2413129) |
| Huawei R4-2412440 and R4-2412443(Henry)Similar comments made for R4-2413129 apply. Also given that the table for frequency separation is for the deafult per band and RAN2 spec can allow to configure different separation with a UE, the range doesn’t have to be described. |
| Qualcomm (Toni) flag:R4-2412443/R4-2412440: further discussion needed between these and approach in R4-2413129 |
| [**R4-2412445**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412445.zip) | (LTE\_NBIoT\_eMTC\_NTN\_req-Core) CR to 36.102 In-band NB-IoT NTN deployment with NR (Inmarsat, Viasat) | Revised |
| Huawei R4-2412445 and R4-2412450(Jin)Need further discussion since in-band mode is not supported for NB-IoT NTN yet. |
| MTK R4-2412445 and R4-2412450 (Daniel)NB-IoT NTN standalone operation is mandatory. Regarding additional feature of in-band operation, when supporting the feature is agreed, the feasible way would be to further introduce that in-band MDL values = original MDL values +0.5 |
| Qualcomm (Toni) flag:R4-2412445 R4-2412450: Should consider new formulas for in-band operation, needs to be optional to rel-17 and rel-18 UEs. |
| [**R4-2412450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412450.zip) | (LTE\_NBIoT\_eMTC\_NTN\_req-Core) CR to 36.108 In-band NB-IoT NTN deployment with NR (Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks) | Revised |
| Huawei R4-2412445 and R4-2412450(Jin)Need further discussion since in-band mode is not supported for NB-IoT NTN yet. |
| MTK R4-2412445 and R4-2412450 (Daniel)NB-IoT NTN standalone operation is mandatory. Regarding additional feature of in-band operation, when supporting the feature is agreed, the feasible way would be to further introduce that in-band MDL values = original MDL values +0.5 |
| Qualcomm (Toni) flag:R4-2412445 R4-2412450: Should consider new formulas for in-band operation, needs to be optional to rel-17 and rel-18 UEs. |
| [**R4-2412606**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412606.zip) | (TEI18) R18 Cat-F CR 38.101-3 channel spacing for intra-band EN-DC (Huawei, HiSilicon) | Revised |
| QC R4-2412606 [Ville/Antti] We need something like this in the ran4 specs but as opposed to what CR title says, it does not clarify which requirements (contiguos or non-contiguous) apply for this new type of configuration which is non-contiguous but with nominal channel spacing. So we wish to add that clarification in the CR.Also, the sentence is very unclear what is intends to say. UE does not decide channel spacing so the part with "shall" belongs to 38.104 since network decides the channel spacing. Would following sentence be ok: "UE indicating [intraBandENDC-NominalSpacing] shall meet requirements for intra-band non-contiguous EN-DC with equal or greater than nominal channel spacing." |
| CHTTL Tank R4-2412606 maybe the wording can be improved |
| OPPO Jinqiang R4-2412606: The change seems big, and is different from how UE works in the field. And in last meeting LS was sent to RAN2, maybe we need to wait for their conclusions. |
| [**R4-2413355**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413355.zip) | (TEI18) CR to 38.101-1 Rel-18: Corrections of NR operating bands clause in FR1 (Ericsson) | Revised |
| Huawei R4-2413355 (Michal): I would like to highlight formal issue related to the WI code used. Instead of TEI18, it shall rather use spectrum WID code, related to the bands addressed in this CR. This topic has been mentioned by the Chair during Monday join session. Please check with MCC and Chair on their preferred approach. All TEI CRs are monitored by RAN, so better to avoid TEI code to avoid unnecessary turbulences. |
|  |
| R4-2413064 | CR on introduction of new FR2 power class 8 (Huawei, HiSilicon) | Revised |
| Qualcomm - Sumant Iyer: Huawei R4-2413064 (new UE power class) does not have good technical backing yet. We are not ready to agree with this CR. The discusison paper has good technical content, but it lacks a link budget, as well as some idea of how many devices are expected to be supported per gNB. More importantly, it does show how 16.4 dBm EIRP can support a sustained 20 Mbps in UL. |
|  |

# Annex TEI guideline:



The agreement can be found in RP-202867.

For example:

1. The first sets of CRs for [2Rx\_XR\_Device] were approved with Cat B in the RAN#103 meeting. The [2Rx\_XR\_Device] is the TEI identifier.





1. Later, a maintenance CR was agreed in the RAN4#111 meeting with Cat F.

