**3GPP TSG-RAN WG4 Meeting # 109 R4-2318109**

**Chicago, USA, 13th – 17th November, 2023**

**Agenda item:** 6.4

**Source:** Moderator (Meta Ireland)

**Title:** Topic summary for [109][103] R18\_UERF\_maintenance

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of the topic summary discussion (e.g. list of treated agenda items) and provide some guidelines for the topic discussion lists if necessary.*

In the [109][103] R18\_UERF\_maintanance, RAN4 treat the contributions for Rel-18 maintenance for LTE and NR which were already completed in Rel-18 WIs.

Candidate target are listed as follows.

* Topic #1: Maintenance of LTE related Wis in Rel-18
	+ Sub-Topic 1-1: LTE terrestrial broadcast bands
	+ Sub-Topic 1-2: LTE release independent specifications
	+ Sub-Topic 1-3: LTE 900MHz in US
* Topic #2: Maintenance of NR related Wis in Rel-18
	+ Sub-Topic 2-1: NR release independent specifications
	+ Sub-Topic 2-2: Maintenance of NR-U UE
	+ Sub-Topic 2-3: NR 600MHz\_APT UE
	+ Sub-Topic 2-4: PA calibration for future release
* Topic #3: Maintenance of NB-IoT/eMTC for NTN WI
	+ Sub-Topic 3-1: IoT NTN UE RF in ETSI
	+ Sub-Topic 3-2: LTE Out-of-band emission
	+ Sub-Topic 3-3: Tx-Rx separation for IoT NTN
	+ Sub-Topic 3-4: Simplification of NS flags in TS36.102

# Topic #1: Maintenance of LTE related WIs in Rel-18

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2318249](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318249.zip) (CR) | Qualcomm, SWR, EBU | Title: CR to remove brackets in TS36.101: Correction for LTE terrestrial broadcast bands for LTE band 107 and 108**This is a Cat. F CR for TS36.101 in Rel-18**Table 7.3.1H-1: Reference sensitivity for LTE based 5G terrestrial broadcast

|  |  |  |
| --- | --- | --- |
| Operating Band | PMCH bandwidth | Duplex Mode |
| 6 MHz(dBm) | 7 MHz(dBm) | 8 MHz(dBm) |
| 107 | -99.2 | -98.5 | -97.9 | SDO |
| 108 | -99.2 | -98.5 | -97.9 | SDO |
| NOTE: The signal power is specified per port |

Table 7.5.1H-1: Adjacent channel selectivity for LTE based 5G terrestrial broadcast

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units | PMCH bandwidth |
| 6 MHz | 7 MHz | 8 MHz |
| ACS | dB | 29.0 | 30.5 | 31.5 |

 |
| [R4-2318414](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318414.zip) | Apple | Title: Further considerations on ACS for 5G terrestrial broadcastProposal 1:Set ACS values for 6, 7 and 8MHz PMCH channel in accordance with the baseline WI objectives of not using dedicated filters at the UE side.Proposal 2:Set REFSENS values for 6, 7 and 8MHz PMCH channel in accordance with the baseline WI objectives of not using dedicated filters at the UE side |
| [R4-2318415](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318415.zip)(CR) | Apple | Title: Further considerations on ACS for 5G terrestrial broadcast**This is a Cat. F CR for TS36.101 in Rel-18**Table 7.5.1H-1: Adjacent channel selectivity for LTE based 5G terrestrial broadcast

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units | PMCH bandwidth |
| 6 MHz | 7 MHz | 8 MHz |
| ACS | dB | 17 | 18.5 | 20 |

Table 7.5.1H-3: Test parameters for Adjacent channel selectivity, Case 2

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | PMCH bandwidth |
| 6 MHz | 7 MHz | 8 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -49.5 | -51 | -52 |
| PInterferer | dBm | -25 |
| BWInterferer  | MHz | 5 |
| FInterferer (offset) | MHz | 5.5+0.0125/-5.5-0.0125 | 6.0+0.0075/-6.0-0.0075 | 6.5+0.0025/-6.5-0.0025 |
| NOTE: The interferer consists of the Reference measurement channel specified in Annex A.3.18. |

 |
| [R4-2320840](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320840.zip) (CR) | Huawei, Hisilicon | Title: [LTE\_terr\_bcast\_bands\_part2-Core] CR to TS 36.104: Separation of additional ACLR requirements for LTE based 5G terrestrial broadcast, Rel-18**This is a Cat. F CR for TS36.104 in Rel-18**- Add references corrected and detailed and included the missing abbreviations - In clause 6.6.0, updated the references and updated unwanted emission requirements as followTable 6.6.0-1: References to regional requirements on unwanted emissions for terrestrial broadcast BS

|  |  |
| --- | --- |
| ITU Region 1 | * ETSI EN 302 296 [22] Digital Terrestrial TV Transmitters
* ITU GE06 Agreement [25]
 |
| ITU Region 2 | * Title 47 CFR 73.622 [26] Digital television table of allotments, FCC, United States
* ABNT NBR 15601 [27], Digital terrestrial television – Transmission system
 |
| ITU Region 3 | * GB20600-2006 [28]
 |

- In clause 6.6.2.0, add the title with “Additional ACLR requirements for LTE based 5G terrestrial broadcast” to separate from the General requirements. |
| [R4-2320841](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320841.zip) (CR) | Huawei, Hisilicon | Title: [LTE\_terr\_bcast\_bands\_part2-Core] CR to TR 36.792: adding missing figures, general cleanup, Rel-18**This is a Cat. F CR for TR36.792 in Rel-18**- Add reference updated, fixed and detailed- Included the missing emission mask figured in clause 4.4.2- updated editorial corrections in TR36.792 |
| [R4-2320888](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320888.zip) (CR Cat.B Rel-16)[R4-2320893](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320893.zip) (rel-17)[R4-2320898](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320898.zip) (rel-18) | ROHDE & SCHWARZ, SWR, Qualcomm, EBU | Title: Introduction of 5G broadcast UHF bands to 36.104 (Rel-16): adding missing figures, general cleanup, Rel-18**This is a Cat. B CR for TR36.104 in Rel-16**- Add LTE terrestrial broadcast band in clause 5.5Table 5.5-7: LTE based 5G terrestrial broadcast operating bands

|  |  |  |  |
| --- | --- | --- | --- |
| Operating Band | Uplink (UL) operating bandBS receiveUE transmit | Downlink (DL) operating bandBS transmit UE receive | Duplex Mode |
| FUL\_low – FUL\_high | FDL\_low – FDL\_high |
| 107 |  | N/A |  | 612 MHz | – | 652 MHz | SDO |
| 108 |  | N/A |  | 470 MHz | – | 698 MHz | SDO |

- In clause 5.6, R&S proposed the following transmission BW configuration contentsThe LTE based 5G terrestrial broadcast network operates on 6, 7, and 8 MHz channels and the requirements in this specification apply according to configuration by the higher layer parameter *pmch-Bandwidth* (see TS 36.213 [11]) in the MBSFN area (see TS 36.331 [XX]). The transmission bandwidth configuration for LTE based 5G terrestrial broadcast are defined in table 5.6-4.Table 5.6-4: Transmission bandwidth configuration NRB for 5G terrestrial broadcast

|  |  |  |  |
| --- | --- | --- | --- |
| **PMCH bandwidth [MHz]** | **6** | **7** | **8** |
| Transmission bandwidth configuration $N\_{RB}^{PMCH}$ | 30 | 35  | 40 |

- In clause 5.7, R&S proposed the following channel spacing contentsFor LTE based 5G terrestrial broadcast, the nominal channel spacing between adjacent broadcast channels is defined as followsNominal Channel spacing = PMCH bandwidthwhere PMCH bandwidth is the broadcast bandwidth for all broadcast carriers in the same geographical area is indicated by upper layer signaling *pmch-Bandwidth* in the MBSFN area (see TS 36.331 [XX]). The requirements in this specification do not apply for heterogeneous broadcast bandwidths in the same geographical area.- In clause 5.7.3, R&S proposed the following EARFCN contentsThe EARFCN for applicable bands designated for LTE based 5G terrestrial broadcast according to Table 5.5-7 are specified in Table 5.7.3-2.Table 5.7.3-2: E-UTRA channel numbers for LTE based 5G terrestrial broadcast

|  |  |  |
| --- | --- | --- |
| OperatingBand | Downlink | Uplink |
| FDL\_low (MHz) | NOffs-DL | Range of NDL | FUL\_low (MHz) | NOffs-UL | Range of NUL |
| 107 | 612 | 70656 | 70656 – 71055 | N/A |
| 108 | 470 | 71056 | 71056–73335 | N/A |
| NOTE 1: The channel numbers that designate carrier frequencies so close to the operating band edges that the broadcast carrier with PMCH bandwidth extends beyond the operating band edge shall not be used.  |

- Add information note which requirements doesn’t applicable for LTE terrestrial broadcast BS such as Output power dynamics, Time alignment error, co-location with other base stations and Receiver RF requirements in clause 7. - Add Unwnated emission requirements with the following contentsFor LTE based 5G terrestrial broadcast base stations the universal emission requirements are described in the existing Recommendation ITU-R BT.1206 [AA] Spectrum limit masks for digital terrestrial television broadcasting. The spectrum masks defined in the ITU-R BT.1206 [AA] recommendation are not based on the ITU-R Region but on the DTT system (ATSC, DVB-T, ISDB-T, and DTMB) and for different TV channel rasters (6, 7, and 8 MHz) used independent of the region/country. In addition to universal requirements for the unwanted emissions, regional regulatory requirements are specified in the references shown in Table 6.6-1.Table 6.6-1: References for regional terrestrial broadcast base station emission requirements

|  |  |
| --- | --- |
| ITU Region 1 | ETSI EN 302 296 Digital Terrestrial TV Transmitters; and GE06 agreement |
| ITU Region 2 | Title 47 CFR 73.622, Digital television table of allotments, FCC, United StatesABNT 15601, NORMA BRASILEÑA, Televisión digital terrestre — Sistema de transmisión ISDB-Tb, Anatel, Brazil  |
| ITU Region 3 | GB20600-2006  |

- Add ACLR, unwanted emission and Tx spurious emissions requirements with the following contentsFor LTE based 5G terrestrial broadcast, the ACLR requirement is according to regional regulations, but shall be no less than 45 dB. Examples are captured in TRxxx [YY].For LTE based 5G terrestrial broadcast, the operating band unwanted emission requirements are according to regional regulations. Examples are captured in TRxxx [YY].For LTE based 5G terrestrial broadcast, the transmitter spurious emission requirements are according to regional regulations. Examples are captured in TRxxx [YY] |
| [R4-2318403](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318403.zip) (CR) | CATT | Title: Correction of TS 36.307: spec release problem**This is a Cat. F CR for TS36.307 in Rel-18 as TEI**Proposal: Correct the wrong spec. release problem in TS36.307 Specification.In some clauses i.e. 3A.1, 3A.2, 3A.3, 3A.4 and Annexes for Additional E-UTRA or CA operating bands, CATT proposed to update the release information from Rel-17 to Rel-18 for TS36.307 Rel-18 as follow example,3A.1 Additional E-UTRA operating bandsRequirements for a Rel-18 UE for additional E-UTRA operating bands compared to TS 36.101 Rel-18 [2] are introduced via this clause. |
| [R4-2318514](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318514.zip) | Nokia | Discussion on release independence specs 38.307 and 36.307**proposed to replace an explicit reference to specification release with release number by referring to release as “this release”. CRs are provided for latest versions of 36.307 [1] and 38.307 [2].**- For TS36.307, Nokiad propose as follow Requirements for additional E-UTRA operating bands for UE supporting this release, compared to TS 36.101 of this release, are introduced via this clause in TS 36.307 of the release in which the band was introduced.- For TS38.307, Nokiad propose as followRequirements for additional NR FR1 operating bands for UE supporting this release, compared to TS 38.101-1 [2] of this release, are introduced via this clause in TS 38.307 of the release in which the operating band was introduced. |
| [R4-2318515](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318515.zip) (CR) | Nokia | Title: CR for 36.307 General enhancement for future purposes and necessary fixes**This is a Cat. F CR for TS36.307 in Rel-18**3A.1 Additional E-UTRA operating bandsRequirements for additional E-UTRA operating bands for UE supporting this release, compared to TS 36.101 of this release, are introduced via this clause in TS 36.307 of the release in which the band was introduced.Same changes are reflected in clause 3A.2, 3A.3, 3A.4 and Annexes |
| [R4-2318533](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318533.zip) (CR) | Nokia, Anterix | Title: CR for 36.307 B106 and B8 overlapping bands: This is related to LTE\_900MHz WI for US.**This is a Cat. B CR for TS36.307 in Rel-18**Proposal: NR bands n8 and n109 are overlapping thus those need to be added into over lapping bands table A-1 as follow;Table A-1: Overlapping bands (multi-band environments) for each E-UTRA band

|  |  |  |
| --- | --- | --- |
| E-UTRA Operating Band | Overlapping E-UTRA operating bands | Duplex Mode |
| 2 | 25 | FDD |
| 3 | 9 | FDD |
| 4 | 10, 66 | FDD |
| 5 | 18, 19, 26 | FDD |
| 8 | 106 | FDD |
| 9 | 3 | FDD |
| 10 | 4, 66 | FDD |
| 12 | 17 | FDD |
| 17 | 12 | FDD |
| 18 | 5, 26, 27 | FDD |
| 19 | 5, 26 | FDD |
| 25 | 2 | FDD |
| 26 | 5, 18, 19, 27 | FDD |
| 27 | 18, 26 | FDD |
| 33 | 39 | TDD |
| 38 | 41 | TDD |
| 39 | 33 | TDD |
| 41 | 38 | TDD |
| 66 | 4, 10 | FDD |
| 106 | 8 | FDD |

 |

## Open issues summary

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

### Sub-topic 1-1

*Sub-topic description:* **LTE terrestrial broadcast bands**

*Open issues and candidate options before meeting:*

**Issue 1-1-1:** Update REFSENS/ACS requirements in TS36.101

* Proposals
	+ Option 1: Based on CR ([R4-2318249](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318249.zip), QC), RAN4 can remove square brackets in REFSENS and ACS requirements in TS36.101.
	+ Option 2: Based on CR ([R4-2318415](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318415.zip), Apple), RAN4 can relax the ACS levels in TS36.101 considering without dedicated filter to support small CBWs in n107 and n108.
* Recommended WF
	+ RAN4 can keep the REFSENS requirements without []. Need more input from the interested companies to finalize the ACS requirements for LTE terrestrial broadcast UE.

**Issue 1-1-2:** ACS test parameters in TS36.101

* Proposals
	+ Option 1: Based on CR ([R4-2318415](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318415.zip), Apple), RAN4 can relax the Pinterferer level with -25dBm instead of -22dBm for ACS, Case 2 in Table 7.5.1H-3.
	+ Option 2: Keep the current specification in TS36.101
* Recommended WF
	+ Need more input from interested companies.

**Issue 1-1-3:** Additional ACLR requirements in TS36.104

* Proposals
	+ Option 1: Based on CR ([R4-2320840](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320840.zip), Huawei), RAN4 can update the references of the regional unwanted emission levels and distinguish the additional ACLR requirements from the general ACLR requirements.
* Recommended WF
	+ Option 1 is agreeable.

**Issue 1-1-4:** Updated references and emission mask requirements in TR36.792

* Proposals
	+ Option 1: Based on CR ([R4-2320841](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320841.zip), Huawei), RAN4 can update the references and add spectrum emission masks for 7MHz Channelling system B (DVB-T).
* Recommended WF
	+ Option 1 is agreeable.

**Issue 1-1-5:** Introduce LTE terrestrial broadcast BS RF requirements in TS36.104 in Rel-16.

* Proposals
	+ Option 1: Based on CR ([R4-2320888](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320888.zip), R&S, SWR, Qualcomm, EBU), RAN4 can introduce LTE terrestrial broadcast RF requirements in TS36.104 in Rel-16.
	+ Option 2: TBA.
* Recommended WF
	+ Based on e-mail discussion on the CR, RAN4 Chairman recommended that the CR could be use TEI with special TEI-ID provided as WI code for Cat. B CR in Rel-16. Please refer to R4-2318002 (meeting guidance document) for how to provide TEI CR even though the CR contents are fine with all interested companies.

### Sub-topic 1-2

*Sub-topic description*: **LTE release independent specifications**

*Open issues and candidate options before meeting:*

**Issue 1-2-1:** LTE release independent specification of TS36.307

* Proposals
	+ Option 1: Based on CR ([R4-2318403](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318403.zip), CATT), RAN4 update the explicit release number for TS36.307 in Rel-18.
	+ Option 2: Based on CR ([R4-2318515](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318515.zip), Nokia), RAN4 can use “this release” instead of the explicit references into the number of release specification.
* Recommended WF
	+ Option 2. To reduce editorial error, option 2 (CR [R4-2318515](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318515.zip)) is agreeable.

### Sub-topic 1-3

*Sub-topic description*: **LTE 900MHz in US**

*Open issues and candidate options before meeting:*

**Issue 1-3-1**: Update overlapping bands information for LTE 900MHz in US

* Proposals
	+ Option 1: Based on CR([R4-2318533](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318533.zip), Nokia), RAN4 update the overlapping operating band information in Annex A in TS36.307.
	+ Option 2: TBA
* Recommended WF
	+ Option 1. The CR([R4-2318533](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318533.zip)) is agreeable.

# Topic #2: Maintenance of NR related WIs in Rel-18

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2318516](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318516.zip) (CR) | Nokia | Title: CR for 38.307 General enhancement for future purposes and necessary fixes**This is a Cat. F CR for TS38.307 in Rel-18**5.1 Additional NR operating bands and UE power classes for NR frequency range 1Requirements for additional NR FR1 operating bands for UE supporting this release, compared to TS 38.101-1 [2] of this release, are introduced via this clause in TS 38.307 of the release in which the operating band was introduced.Same changes are reflected in clause 5.2.1, 5.2.2, 5.3, 5.4, 5.5, 5.7, 5.8, 6.1, 6.2, 7.1, 7.2, 8.1, 8.2 and Annexes |
| [R4-2318404](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318404.zip) (CR) | CATT | Title: Correction of TS 38.307: spec release problem**This is a Cat. F CR for TS3.307 in Rel-17 as TEI****Proposal:** Correct the wrong spec. release problem in TS38.307 Specification.In some clauses i.e., 5.2.1, 5.2.2, 5.3, 5.4, 5.5, 5.7, 5.8, 6.1, 6.2, 7.1, 7.2, 8.1, 8.2 and Annexes, CATT proposed to update the explicit Release number with Rel-17 for TS37.307 to correct the wrong spec release number. |
| [R4-2319863](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319863.zip) | Huawei, HiSilicon | Title: Release independence] Discussion on how to comprehend and implement Requirements on User Equipments (UEs) Supporting a release-independent frequency band in 38.307**This is discussion paper for TS38.307 how to introduce and apply the release independent requirements of TS38.101-1 and TS38.101-3****Proposals:** - Observation 1: Different draft ways in TS 38.307 can be found for Shared spectrum access operating bands and UL MIMO operating bands. For Shared spectrum access operating bands, it seems that option B or option A-2 is used. For UL MIMO operating bands, it seems that option A-1 is used. - Observation 2: In the following paragraph introduced in CR [5], the “new feature” means general feature, e.g. Shared spectrum access and UL MIMO, and “RF feature” means Shared spectrum access operating bands and UL MIMO operating bands. **- Proposal 1: If the observation 2 is correct, the following problems for current option A-2 method need to be addressed.** **1st problem: Timely impossible to treat both RF and Demod at same time due to unpredictability.****2nd problem: option A-2 will fall back to option B (When a new feature is introduced, all of the releases of release independent spec are updated, starting from the release which the feature is release independent from.****3rd problem: Uncertainty whether necessity of some CRs to the frozen release under the maintenance WI or under the performance WI code****4th problem: when every feature (e.g. Rel-18 ATG, UAV and Rel-18 ka band NTN) is introduced, the latest release independent spec which refers to the release which the new feature is introduced in should be updated****- Proposal 2: the release independent features of TS 38.307 are only related to the additional NR operating bands and power classes which were approved by TSG-RAN with a clear objective instead of other general features.** **- Proposal 3: Since CRs to previous frozen release will cause some problems and misunderstanding about version control, it’s proposed not to introduce some CRs to previous frozen release under the open release WI code.** **- Proposal 4: Working group can trade-off the following solutions.****Modified Option A-1:** In order to follow the version control rule, it’s proposed to introduce the fulfilled requirements during the open release of TS 38.307 under a performance WI code only when a release independent band is introduced. (For example, band n102 is a release independent band for NR-U introduced in Rel-17, but band n46 and n96 are exemplary bands under Rel-16 NR-U. Thus, the fulfilled requirements for NR-U operating bands should be introduced in Rel-17 TS 38.307.) **Modified Option A-2:****Two step methods:** **Step 1:** In order to follow the version control rule, it’s proposed to introduce an “empty” table for release independent bands during the open release of TS 38.307 under a performance WI code only when the exemplary bands are introduced together in the same open release. As companies can’t predict whether there is a release independent band in the future release, a clear performance objective for TS 38.307 should be specified in WI for the potential release independent bands in the future. (For example, an “empty” table for release independent bands can be introduced in Rel-16 TS 38.307 when exemplary bands n46 and n96 were introduced under Rel-16 NR-U.) **Step 2:** In order to follow the version control rule, it’s proposed to introduce the fulfilled requirements during the open release of TS 38.307 under a performance WI code only when a release independent band is introduced. (For example, band n102 is a release independent band for NR-U introduced in Rel-17, but band n46 and n96 are exemplary bands under Rel-16 NR-U. Thus, the fulfilled requirements for NR-U operating bands should be introduced in Rel-17 TS 38.307.) |
| [R4-2318743](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318743.zip) (CR) | Apple | Title: Corrections on requirements for NR-U enhancements for TS38.101-1**This is a Cat. F CR for TS38.101-1 in Rel-18****Proposal:** - Channel raster: Enable the lowest 20MHz range as ‘DL only’ for n96 and n102.- Fixing to high MPR for single Tx PC3 in Table 6.2F.2-3. The exception for 100MHz Full is corrected to 4.0dB.Table 5.4.2.3-3: Allowed NREF (NR-ARFCN) for operation in Band n96

|  |  |
| --- | --- |
| Channel Bandwidth | Allowed NREF |
| 20 MHz | 7956681, 797000, 798332, 799668, 801000, 802332, 803668, 805000, 806332, 807668, 809000, 810332, 811668, 813000, 814332, 815668, 817000, 818332, 819668, 821000, 822332, 823668, 825000, 826332, 827668, 829000, 830332, 831668, 833000, 834332, 835668, 837000, 838332, 839668, 841000, 842332, 843668, 845000, 846332, 847668, 849000, 850332, 851668, 853000, 854332, 855668, 857000, 858332, 859668, 861000, 862332, 863668, 865000, 866332, 867668, 869000, 870332, 871668, 873000, 874332 |
| 40 MHz | 797668, 800332, 803000, 805668, 808332, 811000, 813668, 816332, 819000, 821668, 824332, 827000, 829668, 832332, 835000, 837668, 840332, 843000, 845668, 848332, 851000, 853668, 856332, 859000, 861668, 864332, 867000, 869668, 872332 |
| 60 MHz | 798332, 799668, 803668, 805000, 809000, 810332, 814332, 815668, 819668, 821000, 825000, 826332, 830332, 831668, 835668, 837000, 841000, 842332, 846332, 847668, 851668, 853000, 857000, 858332, 862332, 863668, 867668, 869000, 873000 |
| 80 MHz | 799000, 804332, 809668, 815000, 820332, 825668, 831000, 836332, 841668, 847000, 852332, 857668, 863000, 868332 |
| 100 MHz | 799668, 803668, 810332, 814332, 821000, 825000, 831668, 835668, 842332, 846332, 853000, 857000,863668, 867668, 869000, 870332, 871668 |
| Note 1: NREF is only applicable for DL only operation |

Table 5.4.2.3-4: Allowed NREF (NR-ARFCN) for operation in Band n102

|  |  |
| --- | --- |
| Channel Bandwidth | Allowed NREF |
| 20 MHz | 7956681, 797000, 798332, 799668, 801000, 802332, 803668, 805000, 806332, 807668, 809000, 810332, 811668, 813000, 814332, 815668, 817000, 818332, 819668, 821000, 822332, 823668, 825000, 826332, 827668 |
| 40 MHz | 797668, 800332, 803000, 805668, 808332, 811000, 813668, 816332, 819000, 821668, 824332, 827000 |
| 60 MHz | 798332, 799668, 803668, 805000, 809000, 810332, 814332, 815668, 819668, 821000, 825000, 826332 |
| 80 MHz | 799000, 804332, 809668, 815000, 820332, 825668 |
| 100 MHz | 799668, 803668, 810332, 814332, 821000, 825000 |
| Note 1: NREF is only applicable for DL only operation |

Table 6.2F.2-3 Maximum power reduction (MPR) for shared spectrum access UE power class 3

|  |  |  |
| --- | --- | --- |
| Pre-coding | Modulation | RB Allocation |
|  |  | Full2 (dB) | Partial3 (dB) | Exception for 100MHz Full5 (dB) |
| DFT-s-ODFM | Pi/2 BPSK4 | ≤ 1.0 | ≤ 1.5 |  |
|  | QPSK | ≤ 1.0 | ≤ 2.0 |  |
|  | 16 QAM | ≤ 1.5 | ≤ 2.5 |  |
|  | 64 QAM | ≤ 2.0 | ≤ 3.0 |  |
|  | 256 QAM | ≤ 4.5 | ≤ 4.5 |  |
| CP-OFDM | QPSK | ≤ 2.0 | ≤ 3.5 | ≤ [4.0] |
|  | 16 QAM | ≤ 2.5 | ≤ 3.5 | ≤ [4.0] |
|  | 64 QAM | ≤ 4.0 | ≤ 4.5 |  |
|  | 256 QAM | ≤ 6.5 | ≤ 6.5 |  |

 |
| [R4-2320049](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320049.zip)(CR) | Nokia | Title: Spectrum emission mask for operation with shared spectrum channel access R18 for TS38.101-1**This is a Cat. F CR for TS38.101-1 in Rel-18**Proposal: - ΔfOOB used and the formulas in Table 6.5F.2.2.0-1 and Table 6.5F.2A.1.2-1 are updated with FOOBThe spectrum emission mask for operation with shared spectrum channel access applies to frequencies (ΔfOOB) starting from the ± edge of the assigned channel bandwidth, up to FOOB. For frequency offsets greater than FOOB, the spurious requirements in clause 6.5.3 are applicable.**Table 6.5F.2.2.0-1: Spectrum emission mask for operation with shared spectrum channel access**

|  |
| --- |
| **Spectrum emission limit (dBr) / Channel bandwidth** |
| **ΔfOOB****(MHz)** | **10, 20, 40, 60, 80, 100 MHz** | **Measurement bandwidth(MBW)** |
| ± 0-1 | $-20 \left|∆f\_{OOB}\right|$ **/ 1 MHz** | [100kHz]3 |
| ± 1-(BWChannel / 2) | – 20 – 8 |ΔfOOB – 1 MHz| / (BWChannel / 2 – 1 MHz) | 1 MHz |
| ± (BWChannel / 2)-BWChannel | – 16 – 24 |ΔfOOB| / BWChannel |  |
| ± BWChannel-FOOB | -40 |  |

The spectrum emission mask for operation with shared spectrum channel access applies to frequencies (ΔfOOB) starting from the ± edge of the assigned aggregated channel bandwidth. For frequency offsets greater than FOOB, the spurious requirements in clause 6.5.3 are applicable.**Table 6.5F.2A.1.2-1: Spectrum emission mask for intra-band contiguous CA operation with shared spectrum channel access**

|  |
| --- |
| **Spectrum emission limit (dBr) / Aggregated channel bandwidth** |
| **ΔfOOB****(MHz)** | **10, 20, 40, 60, 80, 100 MHz** | **Measurement bandwidth(MBW)** |
| ± 0-1 | $-20 \left|∆f\_{OOB}\right|$ **/ 1MHz** | [100kHz]3 |
| ± 1-(BWChannel\_CA / 2) | – 20 – 8 |ΔfOOB – 1 MHz| / (BWChannel\_CA / 2 – 1 MHz) | 1 MHz |
| ± (BWChannel\_CA / 2)-BWChannel\_CA | – 16 – 24 |ΔfOOB| / BWChannel\_CA |  |
| ± BWChannel\_CA -FOOB  | -40 |  |

 |
| [R4-2320174](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320174.zip)(CR) | OPPO | Title: CR to TS38.101-1 for NR-U NS table reference in Rel-18**This is a Cat. F CR for TS38.101-1 in Rel-18**Proposal: In clause 6.2F.3.1, the table 6.2F.3.1-1B is newly added to address new NS values however in the specification, the table is not referred correctly.Table 6.2F.3.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable operating band(s) for each NS value. The mapping of NR frequency band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2F.3.1-1A and table 6.2F.3.1-1B. |
| [R4-2321020](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2321020.zip)(CR) | Apple, Nokia | Title: Adding 20MHz channel raster points for 5925-5945MHz in the full 6GHz band in TS38.104**This is a Cat. F CR for TS38.104 in Rel-18**Proposal: **Add EARFCN 795668 in Note 2 in Table 5.4.2.3-1 for supporting 20 MHz CBW in n96.** NOTE 2: Applicable NR-ARFCN for band n96 for 20 MHz channel bandwidth, NREF = {795668, 797000, 798332, 799668, 801000, 802332, 803668, 805000, 806332, 807668, 809000, 810332, 811668, 813000, 814332, 815668, 817000, 818332, 819668, 821000, 822332, 823668, 825000, 826332, 827668, 829000, 830332, 831668, 833000, 834332, 835668, 837000, 838332, 839668, 841000, 842332, 843668, 845000, 846332, 847668, 849000, 850332, 851668, 853000, 854332, 855668, 857000, 858332, 859668, 861000, 862332, 863668, 865000, 866332, 867668, 869000, 870332, 871668, 873000, 874332} |
| [R4-2321021](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2321021.zip)(CR) | Apple, Nokia | Title: Adding 20MHz channel raster points for 5925-5945MHz in the full and lower 6GHz band in TR38.849**This is a Cat. F CR for TR38.849 in Rel-18**Proposal: **Add EARFCN 795668 in clause 5.2.1 & 5.2.2 in TR38.849 for supporting full and lower 6GHz NR-U operation.** Applicable NR-ARFCN for full 6GHz NR-U:- For 20 MHz channel bandwidth, NREF = {795668, 797000, 798332, 799668, 801000, 802332, 803668, 805000, 806332, 807668, 809000, 810332, 811668, 813000, 814332, 815668, 817000, 818332, 819668, 821000, 822332, 823668, 825000, 826332, 827668, 829000, 830332, 831668, 833000, 834332, 835668, 837000, 838332, 839668, 841000, 842332, 843668, 845000, 846332, 847668, 849000, 850332, 851668, 853000, 854332, 855668, 857000, 858332, 859668, 861000, 862332, 863668, 865000, 866332, 867668, 869000, 870332, 871668, 873000, 874332}Applicable NR-ARFCN for lower 6GHz NR-U:- For 20 MHz channel bandwidth, NREF = {795668, 797000, 798332, 799668, 801000, 802332, 803668, 805000, 806332, 807668, 809000, 810332, 811668, 813000, 814332, 815668, 817000, 818332, 819668, 821000, 822332, 823668, 825000, 826332, 827668} |
| [R4-2319206](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319206.zip)(CR) | ZTE | Title: [NR\_600MHz\_APT-Perf] CR to TS 36.141: Addition of missing band n105 for co-location requirements**This is a Cat. F CR for TS36.141 in Rel-18**Proposal: - **Add MR NR Band n105 in Table 6.6.4.5.5-3** for BS spurious emission limits for Medium range BS co-location requirements- **Add LA NR Band n105 in Table 7.6-4** for Blocking performance requirement for E-UTRA and NB-IoT Local Area BS with co-located with other BS- **Add MR NR Band n105 in Table 7.6-5** for Blocking performance requirement for E-UTRA and NB-IoT Medium Range BS with co-located with other BS\* Please find detail proposed contents in the CR |
| [R4-2319207](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319207.zip)(CR) | ZTE | Title: [NR\_600MHz\_APT-Perf] CR to TS 37.141: Addition of missing band n105 for co-location requirements**This is a Cat. F CR for TS37.141 in Rel-18**Proposal: - **Add NR Band n105 in Table 7.5.5.2-1** for Blocking requirement for co-located with other BS\* Please find detail proposed contents in the CR |
| [R4-2319208](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319208.zip)(CR) | ZTE | Title: [NR\_600MHz\_APT-Perf] CR to TS 38.176-1: Addition of missing band n105 for IAB coexistence and co-location requirements**This is a Cat. F CR for TS38.176-1 in Rel-18**Proposal: - **Add NR Band n105 in Table 6.6.5.5.2-1** for IAB-DU and IAB-MT spurious emission requirements for coexistence with systems operating in other frequency bands.- **Add NR Band n105 in Table 6.6.5.5.3-1** for IAB-DU and IAB-MT spurious emission requirements for co-location with BS or IAB node.\* Please find detail proposed contents in the CR |
| [R4-2318781](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318781.zip) | Qualcomm | This is discussion paper is related to the PA Calibration waveforms in FR1. In previous RAN4 #108 meeting, SKW propose to use 40MHz CBW in future in FR1 as baseline in R4-2311151.**Observation 1: There is little ACLR difference between the 40MHz\_216RB0 DFT-s-OFDM QPSK SCS 15(kHz) waveform and the traditionally used 20MHz\_100RB0 DFT-s-OFDM QPSK SCS 15(kHz) waveform.** **Observation 2: The adoption of a new reference waveform will mean that the existing MPR/A-MPR values will have to be remeasured.****Proposal 1: Continue to use 20MHz\_100RB0 DFT-s-OFDM QPSK SCS 15(kHz) waveform as the reference waveform for PA calibration.** |

## Open issues summary

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

### Sub-topic 2-1

*Sub-topic description:* **NR release independent specifications**

*Open issues and candidate options before meeting:*

**Issue 2-1-1:** CR for updating wording of TS38.307

* Proposals
	+ Option 1: Based on CR ([R4-2318516](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318516.zip), Nokia), RAN4 can use “this release” instead of the explicit references into the number of release specification.
	+ Option 2: Based on CR ([R4-2318404](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318404.zip), CATT), RAN4 can use “explicit release number” in TS38.307.
* Recommended WF
	+ Option 1. To reduce editorial error, option 1 CR ([R4-2318516](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318516.zip)) is agreeable. It will be applied from Rel-18. So CATT CR ([R4-2318404](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318404.zip)) for Rel-17 is also agreeable.

Nokia: both LTE and NR, for LTE there is a pointer in every release. Based on MCC we should change the explicit change the pointer.

**Issue 2-1-2:** How to apply NR release independent manner in TS38.307

|  |
| --- |
| When a new feature is introduced only the latest release of release independent spec needs to be updated. The latest release of release independent spec refers to the release which the new feature is introduced in. If an RF feature introduced in the same release as the release which the feature is independent from, (i.e. M=N), the common UE RF requirements table in annex B.4 is specified from release N+1, otherwise the common UE RF requirements table is specified from release N. |

* Proposals
	+ Option 1: Based on discussion paper ([R4-2319863](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319863.zip), Huawei), RAN4 can update the above contents in the approved WF (R4-2202405).
	+ Option 2: Keep the WF and RAN4 need to make consensus on the other clarification points on top of the approved WF.
	+ Option 3: Other option is not precluded.
* Recommended WF
	+ TBD.

**Issue 2-1-3:** Which organization group shall the responsibility of the release independent features

* Proposals
	+ Option 1:TSG-RAN shall the responsibility of the release independent feature with a clear objective instead of other general features.
	+ Option 2: Other option is not precluded.
* Recommended WF
	+ TBD.

**Issue 2-1-4:** Is it common understanding of the proposal 3 for the release independent features

|  |
| --- |
| **Proposal 3: Since CRs to previous frozen release will cause some problems and misunderstanding about version control, it’s proposed not to introduce some CRs to previous frozen release under the open release WI code.** |

* Proposals
	+ Option 1:Yes.
	+ Option 2: No.
* Recommended WF
	+ TBD.

**Issue 2-1-5:** How to solve the problem in option A-1?

|  |
| --- |
| **Option A: When a new feature is introduced only the latest release of release independent spec needs to be updated.****Option A-1: In any case, only the open release of release independent spec needs to be updated.****Option A-2: The latest release of release independent spec refers to the release which the new feature is introduced in. (i.e. CR to the frozen release might be needed when the release independent issue is missed to be resolved when the new feature is introduced, or when CR implementation errors occur in the previous release.)** |

* Proposals
	+ Option 1:Introduce the fulfilled requirements during the open release of TS 38.307 under a performance WI code only when **a release independent band** is introduced. (For example, band n102 is a release independent band for NR-U introduced in Rel-17, but band n46 and n96 are exemplary bands under Rel-16 NR-U. Thus, the fulfilled requirements for NR-U operating bands should be introduced in Rel-17 TS 38.307.).
	+ Option 2: Other option is not precluded.
* Recommended WF
	+ TBD.

**Issue 2-1-6:** How to solve the problem in option A-2?

|  |
| --- |
| **Option A: When a new feature is introduced only the latest release of release independent spec needs to be updated.****Option A-1: In any case, only the open release of release independent spec needs to be updated.****Option A-2: The latest release of release independent spec refers to the release which the new feature is introduced in. (i.e. CR to the frozen release might be needed when the release independent issue is missed to be resolved when the new feature is introduced, or when CR implementation errors occur in the previous release.)** |

* Proposals
	+ Option 1:Two step method will be applied to option A-2 as follow;
	+ **Two step methods:**
	+ **Step 1**: In order to follow the version control rule, it’s proposed to introduce an **“empty”** table for release independent bands during the open release of TS 38.307 under a performance WI code only when the **exemplary bands** are introduced together in the same open release. As companies can’t predict whether there is a release independent band in the future release, a clear performance objective for TS 38.307 should be specified in WI for the potential release independent bands in the future. (For example, an **“empty”** table for release independent bands can be introduced in Rel-16 TS 38.307 when exemplary bands n46 and n96 were introduced under Rel-16 NR-U.)
	+ **Step 2**: In order to follow the version control rule, it’s proposed to introduce the fulfilled requirements during the open release of TS 38.307 under a performance WI code only when **a release independent band** is introduced. (For example, band n102 is a release independent band for NR-U introduced in Rel-17, but band n46 and n96 are exemplary bands under Rel-16 NR-U. Thus, the fulfilled requirements for NR-U operating bands should be introduced in Rel-17 TS 38.307.)
	+ Option 2: Other option is not precluded.
* Recommended WF
	+ TBD.

### Sub-topic 2-2

*Sub-topic description:* **Maintenance of NR-U UE**

*Open issues and candidate options before meeting:*

**Issue 2-2-1:** EARFCN & MPR updates in TS38.101-1

* Proposals
	+ Option 1: Based on CR ([R4-2318743](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318743.zip), Apple), RAN4 update the EARFCN for 20MHz CBW and PC3 MPR levels for CP-OFDM waveform with QPSK and 16-QAM modulation orders.
	+ Option 2: TBA
* Recommended WF
	+ Need more input. If option 1 is agreeable to all interested companies, RAN4 can agreeable the CR([R4-2318743](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318743.zip)).

**Issue 2-2-2:** EARFCN updates in TS38.104

* Proposals
	+ Option 1: Based on CR ([R4-2321020](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2321020.zip), Apple), RAN4 update the EARFCN for 20MHz CBW in TS38.104.
	+ Option 2: TBA
* Recommended WF
	+ Option 1. CR([R4-2321020](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2321020.zip)) is agreeable.

**Issue 2-2-3:** EARFCN updates in TR38.849

* Proposals
	+ Option 1: Based on CR ([R4-2321021](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2321021.zip), Apple), RAN4 update the EARFCN for 20MHz CBW to support full and lower 6GHz NR-U operation in TR38.849.
	+ Option 2: TBA
* Recommended WF
	+ Option 1. CR([R4-2321021](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2321021.zip)) is agreeable.

**Issue 2-2-4:** Spectrum emission Masks updates in TS38.101-1

* Proposals
	+ Option 1: Based on CR ([R4-2320049](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320049.zip), Nokia), RAN4 update the SEM formular and related wordings in TS38.101-1.
	+ Option 2: TBA
* Recommended WF
	+ Need more input for the update formular in SEM table. If option 1 is agreeable to all interested companies, then CR ([R4-2320049](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320049.zip)) is agreeable.

**Issue 2-2-5:** NS table indication updates in TS38.101-1

* Proposals
	+ Option 1: Based on CR ([R4-2320174](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320174.zip), OPPO), RAN4 update the NS table information in TS38.101-1.
	+ Option 2: TBA
* Recommended WF
	+ Option 1. CR ([R4-2320174](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320174.zip)) is agreeable.

### Sub-topic 2-3

*Sub-topic description:* **NR 600MHz\_APT UE**

*Open issues and candidate options before meeting:*

**Issue 2-3-1:** Add missing band n105 for co-location requirements in TS36.141

* Proposals
	+ Option 1: Based on CR ([R4-2319206](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319206.zip), ZTE), RAN4 can update the BS colocation related requirements in TS36.141.
	+ Option 2: TBA.
* Recommended WF
	+ Option 1. CR ([R4-2319206](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319206.zip)) is agreeable.

**Issue 2-3-2:** Add missing band n105 for co-location requirements in TS37.141

* Proposals
	+ Option 1: Based on CR ([R4-2319207](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319207.zip), ZTE), RAN4 can update the BS colocation related requirements in TS37.141.
	+ Option 2: TBA.
* Recommended WF
	+ Option 1. CR ([R4-2319207](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319207.zip)) is agreeable.

**Issue 2-3-3:** Add missing band n105 for IAB BS coexistence and co-location requirements in TS38.176-1

* Proposals
	+ Option 1: Based on CR ([R4-2319208](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319208.zip), ZTE), RAN4 can update the IAB BS colocation related requirements in TS38.176-1.
	+ Option 2: TBA.
* Recommended WF
	+ Option 1. CR ([R4-2319208](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319208.zip)) is agreeable.

### Sub-topic 2-4

*Sub-topic description:* **PA calibration for future release**

*Open issues and candidate options before meeting:*

**Issue 2-4-1:** PA calibration waveform to simulate or measure the RF requirements in future release

* Proposals
	+ Option 1: Based on discussion paper (R4-2311151, SKW), RAN4 use the updating PA calibration using DFT-s-OFDM QPSK, SCS15(kHz), 40MHz CBW (LCRB = 216 (RBstart=0)) for MPR/A-MPR REFSENS, MSD simulation or measurement studies in FR1.
	+ Option 2: Based on discussion paper ([R4-2318781](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318781.zip), QC), RAN4 keep the legacy PA calibration methodology due to the consistency with other RF requirements according to NR features.
* Recommended WF
	+ The PA calibration issue will be further discussed in future release.

# Topic #3: Maintenance of NB-IoT/eMTC for NTN WI

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2318360](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318360.zip) | Sony | Title: Maintenance on IoT NTN UE RF -- ETSI issueThis is discussion paper to treat mismatch of ETSI emission limits and 3GPP emission requirements.**Observation 1: There is a discrepancy between 3GPP and ETSI SEM requirements, and ETSI SEMs are tighter than 3GPP SEMs at some frequency offsets.** **Observation 2: The discrepancies in CatM1 masks are caused by different SEM specification methods used by 3GPP and ETSI (stepwise SEM in 3GPP vs. linearly dBW-interpolated SEM in ETSI) – these discrepancies may not be critical since the real SEM performance is closer to ETSI method.** **Observation 3: The discrepancies in NB-IoT masks are mostly concerning if NB-IoT is located at the edge of the operating frequency band b255, and a sufficient guard band or A-MPR to help NB-IoT devices to meet the ETSI OOB emission limit when the carrier is on the edge of the operating frequency band.** **Observation 4: Similarly to the approach for FCC SEM, a guard band can be introduced help 3GPP NB-IoT devices meet ETSI OOB emission limits for b255.** **Observation 5: a 200 kHz guardband at the edges of band 255 to ensure the 3GPP NB-IoT devices can always meet the ETSI OOB emission mask when the devices are operating in corresponding EU regions.** **Observation 6: ETSI OOB emission limit is also more stringent in the frequency region that are far from the center freqeucny (e.g., spurious emission region), and also deviate from NS\_02N emission limit.** **Observation 7: Approved by measurements of the typical CatM1 and NB-IoT devices at Tx frequency close to the b255 UL band - all discrepancies between the ETSI and 3GPP masks may be tolerated at the expense of the actual SEM margins except for ETSI OOB requirement for NB-IoT at 100kHz to ~200kHz offset from channel center.****Observation 8: NB-IoT 1-Tone with max Pout (MPR0) is a worst case, which needs a guard band must be larger than 100kHz to meet the ETIS OOB emission requirement.****Observation 9: the 95% TP metric in the 3GPP IBB might be translated to 9dB SNR degradation.** **Observation 10: Different blocking requirements are adopted in the latest draft version of EN 301 681 compared to the latest published version.****Proposal 1: 3GPP pending to capture the ETSI requirement in technical specification and waiting for progress in ETSI.** |
| [R4-2318443](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318443.zip) (CR) | China Telecom, NEC | Title: CR on Unwanted emission requirement for IoT NTN in TS36.181**This is a Cat. F CR for TS36.181 in Rel-18**Proposal:RAN4 agreed to adopt out-of-band emissions instead of Operating band unwanted emissions for NR NTN solutions. It shall applied to NB-IoT/eMTC core for IoT NTN WI.- Add Terminology SAN transponder bandwidth as follow**SAN transponder bandwidth:** Total bandwidth of the carrier(s) in operation by one SAN transponder.NOTE: When the SAN transponder operates one carrier only, the SAN transponder bandwidth is equal to the SAN channel bandwidth of this carrier. **SAN transponder:** part of the SAN permitting to receive, channelize and transmit signals within an allocated bandwidth.- Align with core specification to replace the OBUE requirement by OOB emission requirement and remove OBUE.

| clause number | Requirement | Comments |
| --- | --- | --- |
| 5 | *Operating bands* | Satellite *operating bands* may be applied regionally. |
| 6.6.4,9.7.4 | Out-of-band emissions,OTA out-of-band emissions | For n255 operation in US, Limits in FCC Title 47 apply. |
| 6.6.5, 9.7.5 | Tx spurious emissions,OTA Tx spurious emissions | For n255 operation in US, Limits in FCC Title 47 apply. |

The out-of-band emissions requirement for the SAN transmitter is specified both in terms of Adjacent Channel Leakage power Ratio (ACLR) and out-of-band emissions (OOBE)..

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

\* Please see the other detail changes in the CR.  |
| [R4-2320158](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320158.zip) (CR) | NEC, China Telecom | Title: CR to 36.108: Out-of-band emissions requirements in TS36.108**This is a Cat. F CR for TS36.108 in Rel-18**Proposal:RAN4 agreed to adopt out-of-band emissions instead of Operating band unwanted emissions for NR NTN solutions. It shall applied to NB-IoT/eMTC core for IoT NTN WI.- Add Terminology SAN transponder bandwidth as follow- Align with core specification to replace the OBUE requirement by OOB emission requirement and remove OBUE.The essential contents are same as above [R4-2318443](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318443.zip). |
| [R4-2318712](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318712.zip) (CR) | MediaTek Inc. | Title: [LTE\_NBIOT\_eMTC\_NTN\_req]CR to TS 36.102 on simplification for NS flags**This is a Cat. F CR for TS36.102 in Rel-18**Proposal:Remove almost redundant tables by introducing BWchannel in TS36.102.- Use BWchannel instead of 1.4MHz CBW for using both 200kHz and 1.4MHz CBWs in Table 6.5A.4.4.2-1 for NS\_02N and Table 6.5A.4.4.3-1 for NS\_24 as follow6.5A.4.4.2 Minimum requirement (network signalled value "NS\_02N")When "NS\_02N" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.4.4.2-1 and 6.5A.4.4.2-2, where BWchannel equals to 1.4MHz. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.4.2-1 from the edge of the channel bandwidth. Network signalling remark NS\_02N applies integer-value 2. Table 6.5A.4.4.2-1: Additional requirements for "NS\_02N"

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band(MHz) | Channel bandwidth / Spectrum emission limit1 (dBm) | Measurement bandwidth  | NOTE |
| BWchannel |
| 1559≤ f ≤ 1605 | -50 | 700 Hz | Averaged over any 2 millisecond active transmission interval |
| 1605≤ f ≤ 1610 | -50 + 24/5 (f-1605) | 700Hz |  |
| 1559 ≤ f ≤ 1605 | -40 | 1MHz | Averaged over any 2 millisecond active transmission interval |
| 1605≤ f ≤ 1610 | -40 + 24/5 (f-1605) | 1MHz |  |
| NOTE: The EIRP requirement in regulation is converted to conducted requirement using a 0 dBi antenna. |

- Void the Table 6.5B.4.4.2-1 for NS\_02N for 200kHz CBW and Table 6.5B.4.4.3-1 for NS\_24 for 200kHz CBW. |
| [R4-2319634](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319634.zip) | Inmarsat, Viasat, Globalstar, Ligado Networks, Thales, Sateliot, Hughes/Echostar | Title: Flexible TX-RX Separation for IoT NTN in FR1 bandsThis is discussion paper for decision to support flexible Tx-Rx separation for IoT NTN UE as following proposals.**Observation 1: TS 36.101 already specifies the option for Flexible TX-RX frequency separation for both Cat M1 and Cat NB1/NB2, at least for in-band and guard band operations. Thus implying that the corresponding Cat M1 and Cat NB1/NB2 UE are implicitly expected to be able to support Flexible TX-RX separation at least within the parent LTE or NR channel BW****Observation 2: Flexibility in allocating UL channels in respect to DL channels is a typical mode of operation for existing satellite systems and is becoming a strong requirement for NTN, in order to accommodate deployment of NTN cells around existing services within the NTN bands frequency range.****Observation 3: Given the minimum TX-RX separation even in the worst case, it should be possible to support flexible TX-RX separation for all of the NTN bands.****Proposal 1: Introduce Flexible TX-RX separation for IoT NTN (both Cat M1 and NB1, NB2) within all the NTN bands****Proposal 2: For Flexible TX-RX Separation for IoT NTN, consider separation ranges to span the total bandwidth of the given operating band, or at least within ranges corresponding to the maximum corresponding supported NR channel BWs.** |

## Open issues summary

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

### Sub-topic 3-1

*Sub-topic description:* **IoT NTN UE RF in ETSI:** Specification Gap between ETSI and 3GPP for emission

*Open issues and candidate options before meeting:*

**Issue 3-1-1:** How to resolve the emission limit difference between current ETSI emission limits and 3GPP.

* Proposals
	+ Option 1: Based on the ([R4-2318360](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318360.zip), Sony), RAN4 can wait to finalize the ETSI regulation requirements.
	+ Option 2: Others
* Recommended WF
	+ Need More input from interested companies.

### Sub-topic 3-2

*Sub-topic description:* **LTE Out-of-band emission requirements for IoT NTN**

*Open issues and candidate options before meeting:*

**Issue 3-2-1:** Update Out-of-band emission requirements in TS36.181

* Proposals
	+ Option 1: Based on CR ([R4-2318443](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318443.zip), China Telecom, NEC), RAN4 can update OOB emission requirements in TS36.181 and remove unwanted emission requirements.
	+ Option 2: TBA.
* Recommended WF
	+ Option 1. CR ([R4-2318443](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318443.zip)) is agreeable.

**Issue 3-2-2:** Update Out-of-band emission requirements in TS36.108

* Proposals
	+ Option 1: Based on CR ([R4-2320158](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320158.zip), NEC, China Telecom), RAN4 can update OOB emission requirements in TS36.108 and remove unwanted emission requirements.
	+ Option 2: TBA.
* Recommended WF
	+ Option 1. CR ([R4-2320158](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2320158.zip)) is agreeable.

### Sub-topic 3-3

*Sub-topic description:* **Tx-Rx separation for IoT NTN**

*Open issues and candidate options before meeting:*

**Issue 3-3-1:** Whether support flexible Tx-Rx separation for IoT NTN in Rel-18

* Proposals
	+ Option 1: Based on discussion paper ([R4-2319634](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319634.zip), Inmarsat, Viasat, Globalstar, Ligado Networks and others), RAN4 can support the flexible Tx-Rx separation for IoT NTN (both Cat M1 and NB1, NB2) within all the NTN bands.
	+ Option 2: Keep the default Tx-Rx separation in Rel-18.
* Recommended WF
	+ Need more input from interested companies.

Apple: some band has different frequency allocation. This is beneficial.

Mediatek: it is not proper to apply it for all the bands.

Qualcomm: band 256, 255 were introduced long time ago. There is no flexible.

Skylo: We have today satellite network and we have already use flexible Tx-Rx separation.

Hughes: support it.

**Issue 3-3-2:** Span of Tx-Rx Separation for IoT NTN

* Proposals
	+ Option 1: Based on discussion paper ([R4-2319634](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319634.zip), Inmarsat, Viasat, Globalstar, Ligado Networks and others), RAN4 consider the Tx-Rx separation span will be decided by the total bandwidth of the operating band.
	+ Option 2: Based on discussion paper ([R4-2319634](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2319634.zip), Inmarsat, Viasat, Globalstar, Ligado Networks and others), RAN4 consider the Tx-Rx separation span will be decided by as a minimum within the constraints of the maximum supported channel BW by the corresponding NR NTN operating bands.
	+ Option 3: TBA.
* Recommended WF
	+ Need more input from interested companies.

### Sub-topic 3-4

*Sub-topic description:* **Simplification of NS flags in TS36.102**

*Open issues and candidate options before meeting:*

**Issue 3-4-1:** Update additional emission requirements with NS flags for IoT NTN

* Proposals
	+ Option 1: Based on CR ([R4-2318712](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318712.zip), MTK), RAN4 can update to use “BWchannel” instead of explicit CBW for the additional emission requirements in TS36.102.
	+ Option 2: TBA.
* Recommended WF
	+ Option 1. CR ([R4-2318712](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_109/Docs/R4-2318712.zip)) is agreeable.

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