**3GPP TSG-RAN4 Meeting #106R4**-**2509079**

**Bengaluru, India, – 29th August 2025**

**Agenda Item: 5.1.1**

**Source: Moderator (Xiaomi)**

**Title:** **Topic summary for [116][103] R18\_UERF\_maintenance\_Part1**

**Document for:** **Information**

# Introduction

This t-doc provides topic summary for [115][103] R18\_UERF\_maintenance\_Part1 covering following agenda:

* 5.2 Rel-18 Spectrum related WI maintenance [WI code]
* 5.6.1 UE RF enhancement related UE RF requirements
* 5.7.1 less than 5MHz System parameter and UE RF requirements
* 5.8.1 NB-IoT/eMTC for NTN UE RF requirements
* 5.15.1 [NR\_MC\_enh]UE RF requirements
* 5.16.1 [NR\_SL\_enh2]UE RF requirements (no t-doc submitted)
* 5.29.1 [TEI18] UE RF related topics

List of open issues:

* Sub-topic #1-1 A-MPR NS\_04N/NS\_05N for band 254
	+ Issue 1-1-1: Addtional guard-band/ nominated bandwidth for A-MPR reduction
	+ Issue 1-1-2: Number of tones for A-MPR introduction
	+ Issue 1-1-3: A-MPR value
	+ Issue 1-1-4: Measurement bandwidth
	+ Issue 2-1: Delta TRxSRS for 4Tx
* Issue 3-1: TS 36.102 frequency error requirements correction
* Issue 5-1 Intra-band CA correction
* Issue 5-2 FR2 PC8

It is planned to collect the comments related to CRs, LS and draft CRs in NMW () before the NWM work deadline (Tuesday, 18:00 (local time) during meeting week), and the final decision will be made online.

# Topic #1: Rel-18 spectrum WIs maintenance

## 1.1 Companies contributions

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Proposals/observations |
| [R4-2509527](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509527.zip) | (IoT\_NTN\_FDD\_LS\_band-Core) Power back-off for a UE operating in 1610-1626.5 MHz frequency range | Apple | Proposal 1: For the 12-tone allocation, accounting for the fact that there can be different devices with different filter assumptions, larger than 2dB power back-off can be considered.Proposal 2: Define power back-off for fewer than 12-tone allocations as it will allow the network to use at least the center allocations. |
| [R4-2511407](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511407.zip) | On completing band 254 requirements | Qualcomm Incorporated | Proposal 1: Discuss B254 and B249 A-MPR and emissions requirements together as the requirements are the same.Proposal 2: Consider applying the solutions described in [1] and specification updates in [2] and [3] for band 254 |
| [R4-2509933](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509933.zip)(from AI 5.8.1) | AMPR value and nominated bandwidth for NB-IoT in IoT NTN band b254 | Sony | Observation 1: Smaller MBW (smaller than 30 kHz) is allowed for 3GPP general emission limit of NTN NB-IoT and ETSI EN 301 441 to improve the measurement accuracy. Observation 2: The proposed A-MPR is in Tab. I and II are not sufficient to close the gap between the 3GPP general emission mask for NTN NB-IoT and ETSI emission limits, and it is still possible for a device that is compliant with a 3GPP emission mask to require an even larger A-MPR. Proposal 1: It is proposed to adopt the A-MPR values that is not smaller than the values in Tab. I and Tab. II for NS\_04N and NS\_05N if RAN4 decides to specify the A-MPR value at this moment.Table I A-MPR for NS\_05N

|  |  |
| --- | --- |
| Modulation | QPSK |
| Tone positions for single tone allocation | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| A-MPR | ≤ 12 | 6 | 1 | 0 | 0 | 0 | 0 | 1 | 6 | ≤ 12 |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 9 dB | 0.5 | ≤ 9 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | ≤ 6.5 dB | ≤ 6.5 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | ≤ 3.5 dB |

Table II A-MPR for NS\_04N

|  |  |
| --- | --- |
| Modulation | QPSK |
| Tone positions for single tone allocation | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| A-MPR | ≤10 dB  | 4 | 0.5 | 0 | 0 | 0 | 0 | 0.5 | 4 | ≤ 10 dB  |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 7 dB | 0 | ≤ 7 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | ≤ 4.5 dB | ≤ 4.5 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | ≤ 1.5 dB |

Proposal 2: Adding the note “The measurement bandwidth used may be 3 kHz if the spectrum emission limit are reduced correspondingly.” to both the in-band requirement and out-of-band requirements in NS\_04N and NS\_05N. Proposal 3: RAN4 specifies a 400 kHz nominated bandwidth for NS\_04N and NS\_05N, in parallel to the AMPR approach, allowing UEs to declare which approach to use to meet the emission limit. Proposal 4: RAN4 shall inform ETSI that the nominated bandwidth is particularly useful for reducing the AMPR value for all 3GPP NTN bands. It is recommended that ETSI consider this in its new harmonized standard for 3GPP-based IoT NTN, providing a clear definition of the value and applicability of the nominated bandwidth.  |
| [R4-2510205](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510205.zip)(from AI 5.8.1) | Discussion on UE RF A-MPR for B254 | Nordic Semiconductor ASA | **Observation-1:** With legacy 10kHz NB-IoT guard-band for the stricter NS\_05N:* A-MPR for NS\_05N for edge 1-tone 15kHz would need to be >18dB, to provide enough margin
* A-MPR for NS\_05N for edge 3-tone 15kHz would need to be >13dB, to provide enough margin
* A-MPR for NS\_05N for edge 6-tone 15kHz would need to be >11dB, to provide enough margin
* A-MPR for NS\_05N for edge 12-tone 15kHz would need to be 5.5dB, to provide enough margin

**Proposal-1:** If Option 2 is to be pursued, only the following transmission modes are supported/defined:* 12-tone 15kHz with 5.5dB A-MPR for NS\_05N
* 3-tone 15kHz tone position 3-5 and 6-8 with 2dB A-MPR for NS\_05N
* 1-tone 15kHz tone position 4-8 with 2dB A-MPR for NS\_05N

**Proposal-2:** If there is real desire to operate NB-IoT in b254 (0dB A-MPRs are desired) in the future, NB-IoT UE must be offered additional guard band in b254. At least 50kHz (optimally 100kHz) additional guard band must be defined for NB-IoT SEM. And NS\_04N and NS\_05N A-MPR is set to N/A. |
| [R4-2510778](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510778.zip) | (IoT\_NTN\_FDD\_LS\_band-Core) CR to TS 36.102 to complete unresolved B254 requirements (Rel-18) | MediaTek (Hefei) Inc. | Table 6.2B.3-2: A-MPR for "NS\_04N" Power Class 3

|  |  |
| --- | --- |
| Modulation | QPSK |
| SCS | 15kHz |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 0.7 dB | 0 dB | ≤ 0.7 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | 0 dB | 0 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

Table 6.2B.3-3: A-MPR for "NS\_05N" Power Class 3

|  |  |
| --- | --- |
| Modulation | QPSK |
| SCS | 15kHz |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 1.5 dB | 0 dB | ≤ 1.5 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | ≤ 0.7 dB | ≤ 0.7 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

Table 6.2B.3-4: 1-Tone A-MPR for "NS\_04N" Power Class 3

|  |  |
| --- | --- |
| Modulation | π/4 QPSK |
| Tone positions for 1-Tone allocation (SCS=15kHz) | 0/11 | 1/10 | 2-9 |
| A-MPR | ≤ 0.5 dB | 0 dB | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

Table 6.2B.3-5: 1-Tone A-MPR for "NS\_05N" Power Class 3

|  |  |
| --- | --- |
| Modulation | π/4 QPSK |
| Tone positions for 1-Tone allocation (SCS=15kHz) | 0/11 | 1/10 | 2/9 | 3-8 |
| A-MPR | ≤ 1.5 dB | ≤ 0.8 dB | 0 dB | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

 |

## Open issue list

### Sub-topic #1-1 A-MPR NS\_04N/NS\_05N for band 254

Previous meeting WF (R4-2508104):

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Topic #1: A-MPR value of NS\_04 and NS\_05 for b254**Issue 1-1: A-MPR values of 12 tones of NS\_04 and NS\_05 for b254**It is agreed to adopt the following A-MPR values for 12 tone allocation. Table I A-MPR for NS\_05N

|  |  |
| --- | --- |
| Modulation | QPSK |
| Tone positions for 12 Tones allocation | **0-11** |
| A-MPR | ≤ [3.5 or 5.5] dB |

Table II A-MPR for NS\_04N

|  |  |
| --- | --- |
| Modulation | QPSK |
| Tone positions for 12 Tones allocation | **0-11** |
| A-MPR | ≤ [2 or 4] dB |

**Issue 1-2: A-MPR values of tone numbers other than 12 of NS\_04 and NS\_05 for b254**RAN4 will further discuss how to handle the A-MPR values for other tone numbers of NS\_04 and NS\_05* Option 1: RAN4 only allow 12 tones configuration if NS\_04 and/or NS\_05 is signaled
* Option 2: RAN4 will specify the A-MPR values for other tone numbers and positions in RAN4#116

**Issue 1-3: Measurement bandwidth of A-MPR of NS\_04 and NS\_05 for b254**FFS whether 3kHz measurement bandwidth can be used for A-MPR of NS\_04 and NS\_05 for b254. |

#### Issue 1-1-1: Addtional guard-band/ nominated bandwidth for A-MPR reduction

**Proposals:**

* Option 1: Introduce nominated bandwidth/additional guard-band with separate A-MPR value (zero A-MPR not precluded) (Nordic Semiconductor ASA, Sony, Qualcomm)
	+ Option 1a: 400kHz nominated bandwidth (100kHz guard-band on each side) (Sony, Qualcomm)
* Option 2: Not consider introducing nominated bandwidth in Rel-18

**Recommend WF:**

* If option 1 agreeable, further discuss requirements applicable rule and nominated bandwidth definition including value

#### Issue 1-1-2: Number of tones for A-MPR introduction

**Proposals:**

* Option 1: Only limit to 12 tones configuration for A-MPR introduction
* Option 2: Consider single tone, 3 tones, 6 tones and 12 tones cases for A-MPR introduction (Apple, Sony, Nordic Semiconductor ASA, MTK)

**Recommend WF:**

* Option 2, further discuss detailed A-MPR value and sub-carrier position for small number of tones

#### Issue 1-1-3: A-MPR value

**Proposals:**

* Option 1: Sony (R4-2509933)

Table I A-MPR for NS\_05N

|  |  |
| --- | --- |
| Modulation | QPSK |
| Tone positions for single tone allocation | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| A-MPR | ≤ 12 | 6 | 1 | 0 | 0 | 0 | 0 | 1 | 6 | ≤ 12 |
|  |  |  |  |  |  |  |  |  |  |  |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 9 dB  | 0.5 | ≤ 9 dB  |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | ≤ 6.5 dB | ≤ 6.5 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | ≤ 3.5 dB  |

Table II A-MPR for NS\_04N

|  |  |
| --- | --- |
| Modulation | QPSK |
| Tone positions for single tone allocation | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| A-MPR | ≤10 dB  | 4 | 0.5 | 0 | 0 | 0 | 0 | 0.5 | 4 | ≤ 10 dB  |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 7 dB | 0 | ≤ 7 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | ≤ 4.5 dB | ≤ 4.5 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | ≤ 1.5 dB |

* Option 2: Nordic Semiconductor ASA (R4-2510205)
	+ 12-tone 15kHz with 5.5dB A-MPR for NS\_05N
	+ 3-tone 15kHz tone position 3-5 and 6-8 with 2dB A-MPR for NS\_05N
	+ 1-tone 15kHz tone position 4-8 with 2dB A-MPR for NS\_05N
* Option 3: MTK (R4-2510778)

Table 6.2B.3-2: A-MPR for "NS\_04N" Power Class 3

|  |  |
| --- | --- |
| Modulation | QPSK |
| SCS | 15kHz |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 0.7 dB | 0 dB | ≤ 0.7 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | 0 dB | 0 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

Table 6.2B.3-3: A-MPR for "NS\_05N" Power Class 3

|  |  |
| --- | --- |
| Modulation | QPSK |
| SCS | 15kHz |
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| A-MPR | ≤ 1.5 dB | 0 dB | ≤ 1.5 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 |
| A-MPR | ≤ 0.7 dB | ≤ 0.7 dB |
| Tone positions for 12 Tones allocation | 0-11 |
| A-MPR | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

Table 6.2B.3-4: 1-Tone A-MPR for "NS\_04N" Power Class 3

|  |  |
| --- | --- |
| Modulation | π/4 QPSK |
| Tone positions for 1-Tone allocation (SCS=15kHz) | 0/11 | 1/10 | 2-9 |
| A-MPR | ≤ 0.5 dB | 0 dB | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

Table 6.2B.3-5: 1-Tone A-MPR for "NS\_05N" Power Class 3

|  |  |
| --- | --- |
| Modulation | π/4 QPSK |
| Tone positions for 1-Tone allocation (SCS=15kHz) | 0/11 | 1/10 | 2/9 | 3-8 |
| A-MPR | ≤ 1.5 dB | ≤ 0.8 dB | 0 dB | 0 dB |
| Note 1: The A-MPR specified here is based on CBW in subclause 5.3B. If nominated BW is introduced, different A-MPR values can be specified. |

**Recommend WF:**

* Larger difference observed between MTK’s result and Sony/Noridc’s results; more discussion required

#### Issue 1-1-4: Measurement bandwidth

**Proposals:**

* Option 1: Maintain as 30kHz (Nordic Semiconductor ASA )
* Option 2: Adding the note “The measurement bandwidth used may be 3 kHz if the spectrum emission limit are reduced correspondingly.” to both the in-band requirement and out-of-band requirements in NS\_04N and NS\_05N. (Sony)

**Recommend WF**

* If no critical issue identified for original MBW, can we keep as it is (option 1)?

## 1.3 List of CRs

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Comments/Recommendation |
| CR to TS 36.102, TR 36.764, TS 38.101-5, TR 38.741, |
| [R4-2509524](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509524.zip) | (IoT\_NTN\_FDD\_LS\_band-Core) Correction of the IoT NTN band 254 NS flag references to the sub-clauses with additional requirements | Apple, Globalstar |  |
| [R4-2509525](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509525.zip) | (IoT\_NTN\_FDD\_LS\_band-Core) Correction of the IoT NTN band 254 NS flag references to the sub-clauses with additional requirements | Apple, Globalstar |  |
| [R4-2509530](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509530.zip)(CAT-A CR R4-2509531) | (IoT\_NTN\_FDD\_LS\_band-Core) Introduction of AMPR for the IOT NTN band 254 | Apple |  |
| [R4-2509528](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509528.zip) | (IoT\_NTN\_FDD\_LS\_band-Core) Additional power back-off results for the IOT NTN band 254 | Apple |  |
| [R4-2509529](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509529.zip) | (IoT\_NTN\_FDD\_LS\_band-Core) Additional power back-off results for the IOT NTN band 254 | Apple |  |
| [R4-2510778](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510778.zip)(CAT-A CR R4-2511670) | (IoT\_NTN\_FDD\_LS\_band-Core) CR to TS 36.102 to complete unresolved B254 requirements (Rel-18) | MediaTek (Hefei) Inc. | Related to Topic 1-1 |
| [R4-2511578](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511578.zip)(CR R4-2511579) | (IoT\_NTN\_FDD\_LS\_band-Core) Rel18 Transmit power density requirements conversion to conducted requirements | Keysight Technologies UK Ltd |  |
| [R4-2509526](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509526.zip) | (NR\_NTN\_LSband-Core) Corrections and clarifications to the NR NTN band n254 NS flags | Apple, Globalstar |  |
| [R4-2509669](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509669.zip)(CAT-A CR R4-2509670) | (NR\_NTN\_LSband-Core) Correction of Tx-Rx separation for n254 | Rohde & Schwarz |  |
| CR to TS 38.101-1, TS 38.101-3 |
| [R4-2509233](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509233.zip) | (TEI18) CR on 38.101-1 correction of HPUE band combination CA\_n7B-n26A-n78A and CA\_n7B-n78(2A) [HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18] | China Telecom Corporation Ltd. | Moderator: there are band combos missing to be implemented into Rel-18 specification, Rel-19 correctly implemented (no needs for mirror CR) |
| [R4-2509880](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509880.zip)(CAT-A CR R4-2509881) | (4Rx\_low\_NR\_band\_handheld\_3Tx\_NR\_CA\_ENDC-Core) CR to correct the typo Clrb for Lcrb in clause 7.3A.5 – TS 38.101-1 | Anritsu Limited |  |
| [R4-2510370](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510370.zip) | (4Rx\_low\_NR\_band\_handheld\_3Tx\_NR\_CA\_ENDC-Core)Correction CR for TS 38.101-1 general description of MSD requirements for 3Tx CA\_R18 | Samsung, ZTE, OPPO | Moderator: No mirror CR needed? |
| [R4-2510924](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510924.zip) | (NR\_CADC\_R18\_2BDL\_xBUL-Core) Correct the harmonic MSD test point for CA\_n5-n77 | ZTE Corporation,Sanechips |  |
| [R4-2510925](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510925.zip) | (NR\_CADC\_R18\_2BDL\_xBUL-Core) Correct the harmonic MSD test point for CA\_n5-n77 and CA\_n77-n85 | ZTE Corporation,Sanechips |  |
| [R4-2510072](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510072.zip)(CAT-A R4-2510073) | (NR\_CADC\_R18\_2BDL\_xBUL-Core) CR to TR 38.101-1 on corrections to band number for CA\_n8A-n77A reference sensitivity\_R18\_CAT\_F | ZTE Corporation, Sanechips |  |
| [R4-2510070](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510070.zip)(CAT-A CR R4-2510071) | (DC\_R18\_xBLTE\_1BNR\_yDL2UL-Core) CR to TR 38.101-3 on corrections to categories of EN-DC configurations\_R18\_CAT\_F | ZTE Corporation, Sanechips |  |

# Topic #2: Rel-18 UE RF WI maintenance

## 2.1 Companies contributions

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Proposals/observations |
| [R4-2509647](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509647.zip) | Delta Ppowerclass and Delta TRxSRS for 4Tx | Huawei, HiSilicon | **Observation 1**: Reporting capability of ΔPPowerClass per SRS AS resource(s), e.g., t1ry, t2ry or t4ry still doesn’t solve the original problem, e.g., it doesn’t preclude UE from performing antenna virtualization, e.g., when ΔPPowerClass is 3 dB for PC1.5 4Tx.**Observation 2**: The solution of reporting capability of ΔPPowerClass per SRS AS resource(s) cannot apply to some other similar cases, e.g., PC1.5 3Tx.**Observation 3**: The capability is only for test purpose and wouldn’t be useful from network operation perspective.**Proposal 1**: Capability to convey ΔPPowerClass shouldn’t be introduced.**Proposal 2**: Following texts should be incorporated into TS38.101-1 to accommodate 26 dBm x 4 and 23 dBm x 4 implementation as well as the request to avoid Antenna Virtualization.In case of 1TyR, the highlighted texts are the delta from our CR of [R4-2500378] in RAN4#114.- 3 or 6dB is applied during SRS transmission occasions with usage in SRS-ResourceSet set as ‘antennaSwitching’ with configured SRS resources in each SRS resource set(s) consisting of one SRS port when PC1.5 UE with four transmit antenna connectors further indicates SRS-TxSwitch capability ‘t1r2’, ‘t1r4’, ‘t1r1-t1r2’, ‘t1r1-t1r2-t1r4’ or further indicates srs-AntennaSwitchingBeyond4RX-r17 as ‘t1r2’, ‘t1r4’ or ‘t1r8’, where the configured power shall be verified per antenna connector per SRS transmission occasion;In case of 2TyR.- 0 or 3dB is applied during SRS transmission occasions with usage in SRS-ResourceSet set as ‘antennaSwitching’ with configured SRS resources in each SRS resource set(s) consisting of two SRS ports when PC1.5 UE with four transmit antenna connectors further indicates SRS-TxSwitch capability 't2r2', 't2r4', 't1r4-t2r4', 't1r1-t1r2-t2r2-t2r4' or 't1r1-t1r2-t2r2-t1r4-t2r4’ or further indicates *srs-AntennaSwitchingBeyond4RX-r17* as ‘t2r2’, ‘t2r4’ or ‘t2r8’, where the configured power shall be verified per a pair of antenna connectors per SRS transmission occasion; |
| [R4-2509197](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509197.zip) | 4 Tx Delta PPowerClass for SRS antenna switching | Qualcomm Technologies | **Proposal: Introduce a capability ΔPPowerClass \_PC2 which has the following ΔPPowerClass values when indicated and when not indicated:****If the capability [ΔPPowerClass \_PC2] is indicated, the following ΔPPowerClass values apply for SRS transmissions:****ΔPPowerClass = 3dB for t1ry****ΔPPowerClass = 0dB for t2ry****ΔPPowerClass = 0dB for t4ry****If [ΔPPowerClass \_PC2] is not indicated, the following ΔPPowerClass values apply for SRS transmissions:****ΔPPowerClass = 6dB for t1ry****ΔPPowerClass = 3dB for t2ry****ΔPPowerClass = 0dB for t4ry** |
| [R4-2509198](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509198.zip) | draft LS on capabilities for Delta PPowerClass for 4Tx SRS transmission | Qualcomm Technologies, Ericsson | LS to RAN 2 with two set of Delta PPowerClass |

## 5.2 Open issue list

### Issue 2-1: Delta TRxSRS for 4Tx

**Proposals:**

* Option 1 (Huawei): Introduce following ΔPPowerClass

ΔPPowerClass  = 3 or 6dB for t1ry

ΔPPowerClass  = 0 or 3dB for t2ry

* Option 2 (Qualcomm): Introduce a capability ΔPPowerClass \_PC2 which has the following ΔPPowerClass values when indicated and when not indicated:

If the capability [ΔPPowerClass \_PC2] is indicated, the following ΔPPowerClass values apply for SRS transmissions:

ΔPPowerClass = 3dB for t1ry

ΔPPowerClass = 0dB for t2ry

ΔPPowerClass = 0dB for t4ry

If [ΔPPowerClass \_PC2] is not indicated, the following ΔPPowerClass values apply for SRS transmissions:

ΔPPowerClass = 6dB for t1ry

ΔPPowerClass = 3dB for t2ry

ΔPPowerClass = 0dB for t4ry

**Recommend WF**

## 5.3 List of CRs

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Comments/Recommendation |
| [R4-2509648](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509648.zip)(CAT-A CR R4-2509650) | Introduction of Delta TRxSRS for 4Tx | Huawei, HiSilicon | Related to issue 2-1 |
| [R4-2511581](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511581.zip) | CR to TS 38.101-1 Rel-18 removing “form factor” from corresponding tables for 4Rx, 8Rx | Ericsson |  |
| [R4-2510051](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510051.zip)(CAT-A CR R4-2510052) | (NR\_ENDC\_RF\_FR1\_enh2-Core)Correction CR for TS 38.101-1 for 4Tx\_Rel-18 | Samsung, Huawei |  |

# Topic #3: Rel-18 IoT NTN WI UE RF maintenance

## 7.1 Companies contributions

*Moderator note: band 254 A-MPR issue handle under Topic #1 (R4-2509933, R4-2510205)*

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Proposals/observations |
| [R4-2510206](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510206.zip) | Inconsistent RAN4 specification regarding doppler pre-compensations in NGSO | Nordic Semiconductor ASA | **Issue1:** Based on current specification and since R17, a UE is not forbidden to pre-compensate doppler autonomously during UL transmission, e.g. on 2ms bases when repetition factor is R=1. For example, a single-tone resource unit is 8ms long, two resource units would be 16ms long, Based on current RAN4 specification, a UE may change doppler pre-compensation frequency between each two out of eight 2ms blocks autonomously when R=1. We believe this is not the specification intention. Therefore, in our opinion, the following condition should be removed. “~~When a repetition period is configured on the uplink for which repetition period (R ) >1~~” to ensure that one repetition period (in case of R=1) is also transmitted with the same doppler frequency pre-compensation, unless eNB configures UL segments. **Issue2:** In addition, our understanding is that “segmentation is applied” corresponds to “when eNB configures UL segments”. This editorial change is not essential if this is a general understanding. |

## Open issue list

### Issue 3-1: TS 36.102 frequency error requirements correction

**Proposals (R4-2510206):**

* **Issue1:** Based on current specification and since R17, a UE is not forbidden to pre-compensate doppler autonomously during UL transmission, e.g. on 2ms bases when repetition factor is R=1. For example, a single-tone resource unit is 8ms long, two resource units would be 16ms long, Based on current RAN4 specification, a UE may change doppler pre-compensation frequency between each two out of eight 2ms blocks autonomously when R=1. We believe this is not the specification intention. Therefore, in our opinion, the following condition should be removed. “~~When a repetition period is configured on the uplink for which repetition period (R ) >1~~” to ensure that one repetition period (in case of R=1) is also transmitted with the same doppler frequency pre-compensation, unless eNB configures UL segments.
* **Issue2:** In addition, our understanding is that “segmentation is applied” corresponds to “when eNB configures UL segments”. This editorial change is not essential if this is a general understanding.

**Recommendation:**

* Check above issues from t-doc R4-2510206, if the proposed modification acceptable, proponent company can bring CR in future RAN4 meeting to fix the issue

## 7.3 List of CRs

|  |  |  |  |
| --- | --- | --- | --- |
| **T-Doc** | **Title** | **Source** | **Comments/Recommendation** |
| [R4-2510269](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2510269.zip)(CAT-A CR R4-2510270) | Correction of single-tone MPR requirement for NB-Iot based Iot-NTN | vivo, MediaTek |  |

# Topic #4: Rel-18 MC WI maintenance

T-docs R4-2509812/R4-2509813 will be handled under thread [102].

|  |  |  |
| --- | --- | --- |
| **TDoc** | **Title** | **Source** |
| [R4-2509812](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509812.zip) | UE capability on UL switching time between NUL carrier and SUL carrier | Xiaomi |
| [R4-2509823](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509823.zip) | LS on switching time capability for carrier switching between SUL carrier and NUL carrier | Xiaomi |

# Topic #5: TEI-18

## 4.1 Companies contributions

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Proposals/observations |
| [R4-2509985](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509985.zip) | Intra-band Contiguous CA Issue and Proposed Resolution | T-Mobile USA | Proposal 1: RAN4 to decide between the following options for how to proceed on the intra-band contiguous CA specification issue:* Option 1: Keep the spec as is
	+ For some configurations there is not enough room for the 30 kHz guardbands with the 30 kHz RBs
	+ Discrepancy between 38.101-1 and 38.104 persists
* Option 2: Copy the formulas for Foffset,low  and Foffset,high from 38.104 to 38.101-1
	+ Aligns 38.101-1 and 38.104
	+ Compatible with single carrier configurations
	+ Doesn’t reflect the max guardband between the two carriers. Not sure if this is necessary, though.
* Option 3: Calculate Foffset,low  and Foffset,high based on the deployed SCS if they are both the same (30 kHz SCS for TDD bands)
	+ Different than the single carrier configuration
	+ Discrepancy between 38.101-1 and 38.104 persists

Proposal 2: RAN4 should adopt Option 2, Copy the formulas for Foffset,low and Foffset,high from 38.104 to 38.101-1. |
| [R4-2511322](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511322.zip) | Discussion on introduction of FR2 PC8 | Huawei, HiSilicon, CTC, CEPRI, OPPO, vivo, Xiaomi, CATT, Spreadtrum, Google, Honor, TD Tech, StarPoint, SRTC | Observation 1: Under hotspot area, FR2 PC8 has many advantages than FR2 PC3 to ensure good user experience and facilitate the FR2 industry development.Observation 2: UE supports RF architecture with 2 panels with 1x2 antenna array each has better performance than UE with 1 panel with 1x4 antenna array.Observation 3: The network deployment FR1-FR2 DC has serious impact on the UL coverage due to the 2 uplinks splitting UE transmit power.Observation 4:* Some operators set low priority for FR2 considering the lessons learned from 5G FR2 network deployment.
* FR2 is mainly used for throughput/capacity improvement in the hotspots area.
* Good user experience is the ultimate target for all feature introduction
* Energy saving in both UE and BS sides should be considered from Day 1 of 6G
* CA across FR1, FR2 and FR3 should be considered to ensure optimized resource use
* Improved network deployment: such as with more beams or TRPs, cell-free and etc., to ensure no cell-edge performance degradation

Observation 5: Only lower transmission chance with lower UL throughput can be adopted for higher output power transmission to meet FCC and ICNIRP EMF compliance requirements.Proposal 1: Introduce FR2 power class 8 with the access control scheme and with the min peak EIRP = 16.4 dBm and EIRP spherical coverage@50%-ile CDF = 5.5 dBm * intraFreqReselectionFR2PC8
* cellBarredFR2PC8
 |
| [R4-2511326](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511326.zip) | LS on introduction of FR2 PC8 | Huawei, HiSilicon | LS to RAN2 related to PC8 UE capabilities |
| [R4-2511369](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511369.zip) | On the options proposed for PC8 | Ericsson | Proposal 1: PC8 is not introducedbased onObservation 1: the peak EIRP of the AIP is also important, particularly for single-panel implementations, a reduction of the peak EIRP by 6 dB by a 1 x 2 element AIP would essentially down shift the entire CDF of the spherical coverage by 6 dB.Observation 2: an NR-CA with DL-only assumption for the lower power-class PC8 is not viable, the UL traffic volume and the UL/DL ratio are considerable at stadium and concert events; FR2 is designed to offer significantly higher data rates than FR1 in hot-spot areas.Observation 3: among the items listed in the proposed WF R4-2508036* PC8 with its min peak EIRP = 16.4 dBm is not acceptable due to the 6 dB reduction of the maximum output power despite a slightly improved 50 percentile spherical coverage requirement as compared to PC7 (5.5 dBm), this option would significantly degrade UL performance and reduce traffic volumes carried by FR2
* an access control/barring scheme similar 2 Rx XR would not be feasible in case PC8 becomes the default handheld implementation and would prevent many users from accessing FR2 resources in hot-spot scenarios
* limiting applicability of the PC8 power class to specific regions by the 3GPP standard is not possible (the 3GPP standards are global)
* PC8-like requirements are already specified for RedCap UEs (PC7); minimum output power capability for other handheld UE types supporting eMBB cannot be reduced to PC8 without significant reduction of performance, the UL traffic volume carried by FR2 is directly proportional to the UL link performance.
 |

## 4.2 Open issue list

#### Issue 5-1 Intra-band CA correction

**Proposals:**

* Proposal 1: RAN4 to decide between the following options for how to proceed on the intra-band contiguous CA specification issue (T-Mobile USA R4-2509985):
* Option 1: Keep the spec as is
	+ For some configurations there is not enough room for the 30 kHz guardbands with the 30 kHz RBs
	+ Discrepancy between 38.101-1 and 38.104 persists
* Option 2: Copy the formulas for Foffset,low  and Foffset,high from 38.104 to 38.101-1
	+ Aligns 38.101-1 and 38.104
	+ Compatible with single carrier configurations
	+ Doesn’t reflect the max guardband between the two carriers. Not sure if this is necessary, though.
* Option 3: Calculate Foffset,low  and Foffset,high based on the deployed SCS if they are both the same (30 kHz SCS for TDD bands)
	+ Different than the single carrier configuration
	+ Discrepancy between 38.101-1 and 38.104 persists
* Proposal 2: RAN4 should adopt Option 2, Copy the formulas for Foffset,low and Foffset,high from 38.104 to 38.101-1. (T-Mobile USA R4-2509985)

**Recommendation:**

* More discussion required

#### Issue 5-2 FR2 PC8

**Proposals:**

* Option 1: Introduce FR2 power class 8 with the access control scheme and with the min peak EIRP = 16.4 dBm and EIRP spherical coverage@50%-ile CDF = 5.5 dBm
	+ intraFreqReselectionFR2PC8
	+ cellBarredFR2PC8
* Option 2: not consider to introduce PC8

*Moderator note: this issue has been discussed for several meeting cycles, better to draw conclusion and stop the discussion in TEI with deadline.*

**Recommendation:**

* Online discussion required

## 4.3 List of CRs

|  |  |  |  |
| --- | --- | --- | --- |
| TDoc | Title | Source | Comments/Recommendation |
| [R4-2509986](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509986.zip)（revised 2511667） | CR for 38.101-1: Corrections for Contiguous Intra-band CA | T-Mobile USA | Related to issue 5-1 |
| [R4-2509987](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509987.zip)(revised2511668) | CR for 38.101-1: Corrections for Contiguous Intra-band CA | T-Mobile USA | Related to issue 5-1 |
| [R4-2511323](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511323.zip) | CR on introduction of RF requirements for FR2 PC8 in TS 38.101-2 [FR2\_PC8] | Huawei, HiSilicon, CTC, CEPRI, OPPO, vivo, Xiaomi, CATT, Spreadtrum, Google, Honor, TD Tech, StarPoint, SRTC | Related to issue 5-2  |
| [R4-2511324](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511324.zip) | CR on introduction of RRM requirements for FR2 PC8 in TS 38.133 [FR2\_PC8] | Huawei, HiSilicon, CTC, CEPRI, OPPO, vivo, Xiaomi, CATT, Spreadtrum, Google, Honor, TD Tech, StarPoint, SRTC | Related to issue 5-2  |
| [R4-2511325](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2511325.zip) | CR on release independence for FR2 PC8 in TS 38.307 [FR2\_PC8] | Huawei, HiSilicon, CTC, CEPRI, OPPO, vivo, Xiaomi, CATT, Spreadtrum, Google, Honor, TD Tech, StarPoint, SRTC | Related to issue 5-2 |
| [R4-2509267](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509267.zip)(R4-2509628) | CR to 38.307: Editorial change on 8RX and UL 7.5KHz shift | CATT |  |
| [R4-2509962](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_116/Docs/R4-2509962.zip) | (TEI18) Updates related to NB-IoT inband operation in NTN NR [NTNNBIoT\_inbandNTNNR] | Viasat |  |