**3GPP TSG-RAN WG4 Meeting # 112 R4-2413412**

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

**Agenda item:** 8.8.5

**Source:** Moderator (Xiaomi)

**Title:** Topic summary for [112][312] NR\_IoT\_NTN\_less\_than\_5MHz\_UERF

**Document for:** Information

# Introduction

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

The contributions for the following agenda items are summarised in this document:

* 8.8.3 1 System parameters
* 8.8.3.2 UE RF requirements

# Topic #1: System parameters

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411604.zip) | Xiaomi | Proposal 1: The transmission bandwidth configuration, minimum guardband and transmission bandwidth configuration for 3MHz CBW of NTN FR1 UE and SAN should reuse the configuration of 3MHz CBW of NR TN FR1 UE as below table.Table 2-2 The max transmission bandwidth configuration and minimum guardband for 3MHz

|  |  |
| --- | --- |
| SCS (kHz) | 3 MHz |
|  | NRB | min GB(kHz) |
| 15 | 15 | 142.5 |

Proposal 2: Introduce 3MHz CBW with 15kHz SCS for NTN FR1 bands n256, n255, n254.Proposal 3: Adopting 100kHz and 10kHz channel raster for 3MHz CBW for NTN FR1 bands.Proposal 4: Operators should confirm whether there is a demand for 3MHz CBW in asymmetric channel bandwidth for NTN UE operating in band n254.Proposal 5: The finer synchronization raster of TN 3MHz CBW should be considered and need be extended to 3000MHz for NTN FR1 3MHz CBW. |
| [**R4-2411855**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411855.zip) | ZTE Corporation, Sanechips | Proposal 1: Define the following system parameters for less than 5 MHz CBW for NR-NTN in FR1-NTN bands.* Maximum transmission bandwidth NRB for 3MHz channel bandwidth is 15 RBs.
* Minimum guard band for 3MHz channel bandwidth is 142.5 kHz.
* Reuse existing channel spacing formula for 3MHz channel bandwidth.
* Reuse existing 100kHz channel raster for 3MHz channel bandwidth.
* Sync raster for 3MHz channel bandwidth is N \* 600 kHz + M \* 50 kHz + 300 kHz, N = 1:1665, M ϵ {1,3,5}, and applicable SS raster entries can be defined as Table 2.1 for 3 MHz channel bandwidth in bands n256, n256, n254.

Table 2.1: Applicable SS raster entries per operating band for 3 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern1 | Range of GSCN(First – <Step size> – Last) |
| n256 | 15 kHz | Case A | 37492 – <1> – 37629 |
| n255 | 15 kHz | Case A | 34267 – <1> – 34424 |
| n254 | 15 kHz | Case A | 39060 – <1> – 39129 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [7]. |

Proposal 2: We prefer to use current approach to define 3MHz channel bandwidth is optional for NR-NTN in FR1-NTN bands. |
| [**R4-2411949**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411949.zip) | Nokia | Proposal 1: Only 15 kHz SCS is considered for 3 MHz channel bandwidth.Proposal 2: Maximum transmission bandwidth configuration for 3 MHz is 15 PRBs.Proposal 3: Minimum guardband for 3 MHz channel bandwidth is 142.5 kHz.Proposal 4: Sync raster design for 3 MHz channel bandwidth in TN bands is reused for FR1-NTN bands.Proposal 5: The range of GSCN for 3 MHz channel bandwidth is defined up to 3 GHz for FR1-NTN bands.GSCN parameters for the global frequency for 3 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 600 kHz + M \* 50 kHz + 300 kHz,N = 1:4999, M ϵ {1,3,5} (Note 1) | 26638+3N + (M-3)/2 | 26640 – 41636 |

Proposal 6: The following SS raster entries for 3 MHz channel bandwidth are proposed for bands n256, n255 and n254.Applicable SS raster entries per operating band for 3 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern | Range of GSCN(First – <Step size> – Last) |
| n256 | 15 kHz | Case A | 37492 – <1> – 37629 |
| n255 | 15 kHz | Case A | 34267 – <1> – 34424 |
| n254 | 15 kHz | Case A | 39060 – <1> – 39129 |

 |
| [**R4-2412077**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412077.zip) | vivo | **Proposal 1:** For FR-1 NTN supporting 3MHz, we propose these for system parameters:* Add 3MHz with 15kHz SCS for NR NTN bands n254, n255, n256
* Reuse NRB number (15RB) and minimum guard band (142.5kHz) for 3MHz
* Extend GSCN parameters for 3MHz channel raster from 1000MHz to 3000MHz for FR1-NTN bands

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 600 kHz + M \* 50 kHz + 300 kHz,N = 4999, M ϵ {1,3,5} (Note 1) | 26638+3N + (M-3)/2 | 26640 – 41636 |
| NOTE 1: Only applicable for 15 PRB DCH transmission within 3 MHz channel bandwidth with punctured PBCH defined in TS 38.211 [6] clause 7.4.3.1. |

 |
| [**R4-2412381**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412381.zip) | CATT | Proposal 1: For NTN support 3 MHz channel bandwidth in FR1, the transmission bandwidth configuration should be defined as Table 2.1-1.Proposal 2: For NTN support 3 MHz channel bandwidth in FR1, the minimum guardband should be defined as Table 2.2-1.Proposal 3: For NTN support 3 MHz channel bandwidth in FR1, the channel bandwidth and SCS per operating band should be defined as Table 2.3-1.Proposal 4: For NTN support 3 MHz channel bandwidth in FR1, the range of frequencies should be defined as 0 – 3000 MHz.Proposal 5: For NTN support 3 MHz channel bandwidth in FR1, the synchronization raster and GSCN per operating band should be defined as Table 2.4-1 and Table 2.4-2. |
| [**R4-2412437**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412437.zip) | Huawei, HiSilicon | Proposal 1: for n254, n255 and n256, the 3MHz CBW is only used in single-carrier operations, excluding RedCap.Proposal 2: For SCS 15 KHz, set NRB =15 which provides larger guard band that results in lower out of band emissions. Proposal 3: Consider a guard band of 142.5 KHz for 3MHz CBW. Proposal 4: No change to be made on the channel raster and channel space.Proposal 5: Extend the Rel-18 3MHz sync raster to 3GHz with N=4999Table 1: GSCN parameters for the global frequency for 3 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 600 kHz + M \* 50 kHz + 300 kHz,N = 1:4999, M ϵ {1,3,5} (Note 1) | 26638+3N + (M-3)/2 | 26640 – 41636 |
| NOTE 1: Only applicable for 15 PRB transmission bandwidth configuration within 3 MHz channel bandwidth with punctured PBCH defined in TS 38.211 [6] clause 7.4.3.1. |

Proposal 6: No additional sync raster point is needed for n254, n255 and n256. The sync raster in proposal 5 is enough.Proposal 7: Use the Rel-18 UE capabilities support3MHz-ChannelBW-Symmetric-r18 and support3MHz-ChannelBW-Asymmetric-r18 for NTN communications. |
| [**R4-2412529**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412529.zip) | Samsung | Proposal 1: Introduce 3MHz (15kHz) CHBW for NTN FR1 bands (n256, n255 and n254) and reuse Maximum transmission bandwidth configuration NRB and minimum guard band from TN specification for 3MHz (15kHz) * Maximum transmission bandwidth configuration NRB :15RB
* Minimum Guard band: 142.5 kHz
* Applicable NTN bands: band n256, n255 and n254

Proposal 2: Reusing TN 3MHz CHBW sync raster design and extending to 3GHz for FR1 NTN bands. GSCN parameters for the global frequency for 3 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 600 kHz + M \* 50 kHz + 300 kHz,N = 1:1665, M ϵ {1,3,5} (Note 1) | 26638+3N + (M-3)/2 | 26640 – 41630 |
| NOTE 1: Only applicable for 15 PRB transmission bandwidth configuration within 3 MHz channel bandwidth with punctured PBCH defined in TS 38.211 [6] clause 7.4.3.1. |

Proposal 3: The detailed sync raster for target NTN bands on supporting 3MHz CHBW as following:Applicable SS raster entries per operating band (FR1-NTN) for 3 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| NTN satellite operating band | SS Block SCS | SS Block pattern1 | Range of GSCN(First – <Step size> – Last) |
| n256 | 15 kHz | Case A | 37492 – <1> –37630 |
| n255 | 15 kHz | Case A | 34269 – <1> – 34424 |
| n254 | 15 kHz | Case A | 39060– <1> – 39129 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [8]. |

 |
| [**R4-2413145**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413145.zip) | Qualcomm Incorporated | Proposal 1: Aligned with TN, 15 RB spectrum utilization for 3 MHz channel bandwidth is used.Proposal 2: NTN sync raster design does not address enhanced channel raster nor other than 15 PRB transmission bandwidth configuration.Proposal 3: Re-use the TN sync raster design for NTN 3 MHz channel bandwidth, only by adjusting the range of frequencies and GSCN values to NTN band frequency range, e.g. 1500 to 3000 MHz. |
| R4-2413232 | Inmarsat, Viasat | Void |
| [**R4-2413361**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413361.zip) | Ericsson India Private Limited | Proposal 1: This WI should only focus on 3 MHz channel bandwidth and the associated system parameters.Proposal 2: Specify the maximum transmission bandwidth configuration NRB = 15 RB for 3 MHz channel bandwidth for all FR1-NTN bands (only consider SCS = 15 kHz).Proposal 3: Specify the minimum guardband 142.5 kHz for SCS = 15kHz for 3 MHz channel bandwidth for all FR1-NTN bands.Proposal 4: Specify 100 kHz channel raster for bands n256, n255 and n254 for spectrum where 3 MHz channel bandwidth is supported.Proposal 5: The same sync raster design with the step size of 600 kHz and an offset of 300 kHz as for the TN FR1 3 MHz channel bandwidth could be specified for FR1-NTN.Proposal 6: For FR1-NTN bands n256, n255 and n254 it should be further studied whether there is a need to introduce some additional sync raster points (GSCN parameters). |
| [**R4-2411541**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411541.zip) | Sony | Observation 1: The major part of the core requirements for Redcap NTN UE has been settled. Observation 2: From the RF perspective, it is feasible for Redcap NTN UE to support a smaller BW. Observation 3: Supporting smaller BW can facilitate power consumption and deployment flexibility for Redcap NTN UE.Proposal 1: It is proposed that the 3Mhz channel BW for Redcap/eRedcap NTN in Rel-19 be specified as well.  |

## 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 Channel bandwidth

*Sub-topic description:*

*Open issues and candidate options before meeting:*

**Issue 1-1-1: Channel bandwidth**

* Proposals
	+ Option 1: Only introduce 3MHz channel bandwidth with 15kHz SCS
	+ Option 2: Only focus on 3MHz channel bandwidth
* Recommended WF
	+ Option 1

**Issue 1-1-2: Operating bands for 3MHz channel bandwidth**

* Proposals
	+ Option 1: Applicable NTN bands: band n256, n255 and n254
	+ Option 2: Others
* Recommended WF
	+ Option 1

**Issue 1-1-3: Maximum transmission bandwidth configuration(NRB)**

* Proposals
	+ Option 1: Reuse 15 RBs for 3MHz channel bandwidth with 15kHz SCS for NR NTN.
	+ Option 2: Others
* Recommended WF
	+ Option 1

**Issue 1-1-4: Minimum guardband**

* Proposals
	+ Option 1: Reuse 142.5kHz minimum guardband for 3MHz channel bandwidth with 15kHz SCS for NR NTN.
	+ Option 2: Others
* Recommended WF
	+ Option 1

**Issue 1-1-5: Asymmetric channel bandwidth**

* Proposals
	+ Option 1: Operators should confirm whether there is a demand for 3MHz CBW in asymmetric channel bandwidth for NTN UE operating in band n254. (Xiaomi)
	+ Option 2: Others
* Recommended WF
	+ TBD

**Issue 1-1-6: Whether 3MHz channel bandwidth for NR-NTN in FR1-NTN bands is mandatory or optional?**

* Proposals
	+ Option 1: Optional (ZTE)
	+ Option 2: Mandatory.
* Recommended WF
	+ TBD

### Sub-topic 1-2 Channel arrangement

*Sub-topic description:*

*Open issues and candidate options before meeting:*

**Issue 1-2-1: Channel spacing**

* Proposals
	+ Option 1: Reuse the existing channel spacing in TS 38.101-1
	+ Option 2: Others
* Recommended WF
	+ Option 1

**Issue 1-2-2: Channel raster**

* Proposals
	+ Option 1: Adopt 100kHz and 10kHz channel raster for 3MHz CBW. (Xiaomi)
	+ Option 2: Adopt 100kHz channel raster for 3MHz channel bandwidth. (ZTE, Qualcomm, Ericsson)
* Recommended WF
	+ TBD

**Issue 1-2-3: Synchronization raster**

* Proposals
	+ Option 1: Reuse TN sync raster for 3MHz channel bandwidth and extend to 3000MHz for NTN FR1 3MHz channel bandwidth.

Extended methods:

* + - Option 1a：(Nokia, CATT)

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 600 kHz + M \* 50 kHz + 300 kHz,N = 1:4999, M ϵ {1,3,5} (Note 1) | 26638+3N + (M-3)/2 | 26640 – 41636 |

* + - Option 1b：(vivo, Huawei, Samsung)

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 600 kHz + M \* 50 kHz + 300 kHz,N = 4999, M ϵ {1,3,5} (Note 1) | 26638+3N + (M-3)/2 | 26640 – 41636 |
| NOTE 1: Only applicable for 15 PRB DCH transmission within 3 MHz channel bandwidth with punctured PBCH defined in TS 38.211 [6] clause 7.4.3.1. |

* + Option 2: Sync raster for 3MHz channel bandwidth is N \* 600 kHz + M \* 50 kHz + 300 kHz, N = 1:1665, M ϵ {1,3,5} (ZTE)
	+ Option 3: NTN sync raster design does not address enhanced channel raster nor other than 15 PRB transmission bandwidth configuration. (Qualcomm)
* Recommended WF
	+ TBD

**Issue 1-2-4: Additional sync raster**

* Proposals
	+ Option 1: No additional sync raster point is needed for n254, n255 and n256 (Huawei)
	+ Option 2: Further studied whether there is a need to introduce some additional sync raster points (Ericsson)
* Recommended WF
	+ TBD

**Issue 1-2-5: SS raster entry**

* Proposals
	+ Option 1: Applicable SS raster entries can be defined as below for 3 MHz channel bandwidth in bands n256, n256, n254 (ZTE, Nokia, CATT)

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern1 | Range of GSCN(First – <Step size> – Last) |
| n256 | 15 kHz | Case A | 37492 – <1> – 37629 |
| n255 | 15 kHz | Case A | 34267 – <1> – 34424 |
| n254 | 15 kHz | Case A | 39060 – <1> – 39129 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [7]. |

* + Option 2: Applicable SS raster entries per operating band (FR1-NTN) for 3 MHz channel bandwidth (Samsung):

|  |  |  |  |
| --- | --- | --- | --- |
| NTN satellite operating band | SS Block SCS | SS Block pattern1 | Range of GSCN(First – <Step size> – Last) |
| n256 | 15 kHz | Case A | 37492 – <1> –37630 |
| n255 | 15 kHz | Case A | 34269 – <1> – 34424 |
| n254 | 15 kHz | Case A | 39060– <1> – 39129 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [8]. |

* Recommended WF
	+ TBD

**Issue 1-2-6: Signalling of SS raster**

* Proposals
	+ Option 1: Use the Rel-18 UE capabilities support 3MHz-ChannelBW-Symmetric-r18 and support 3MHz-ChannelBW-Asymmetric-r18 for NTN communications (Huawei)
	+ Option 2: Others
* Recommended WF
	+ TBD

### Sub-topic 1-3 Applicable 3MHz channel bandwidth

*Sub-topic description:*

*Open issues and candidate options before meeting:*

**Issue 1-3-1: Whether 3MHz channel bandwidth applies to Redcap/eRedcap NTN**

* Proposals
	+ Option 1: For n254, n255 and n256, the 3MHz CBW is only used in single-carrier operations, excluding RedCap. (Huawei)
	+ Option 2: 3MHz channel BW for Redcap/eRedcap NTN in Rel-19 should be specified as well.(Sony)
* Recommended WF
	+ TBD

# Topic #2: UE RF requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411063**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411063.zip) | CATT | Proposal 1: To use the proposals in Table 2.1 for NTN UE RF requirements for NR NTN support 3 MHz channel bandwidth. |
| [**R4-2411605**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411605.zip) | Xiaomi | Observation 1: For NTN FR1 UE Tx RF requirements, there are no specification impact for the requirements of Configured transmitted power, Transmit ON/OFF time mask, Power control, Frequency error, Transmit modulation quality, Additional spectrum emission mask, UTRA ACLR, General spurious emissions and Spurious emissions for UE co-existenceProposal 1: For NTN FR1 UE Tx RF requirements, MPR, Minimum output power, Transmit OFF power, Spectrum emission mask and NR ACLR for NTN 3MHz CBW could reuse the 3MHz requirements of NR TN FR1 UE.Proposal 2: Operators need figure out which NS values need introduce 3MHz CBW, then RAN4 discuss how to define transmit power density, A-MPR and Additional spurious emissions for 3MHz CBW.Observation 2: For NTN FR1 UE Rx RF requirements, there are no specification impact for the requirements of Intermodulation characteristics and Spurious emissions.Proposal 3: For NTN FR1 UE Rx RF requirements, Maximum input level, ACS, In-band blocking, Out-of-band blocking and Spurious response can reuse the requirements for 5MHz, 10MHz of NTN FR1 UE.Proposal 4: For NTN FR1 UE Rx RF requirements, Narrow band blocking can reuse the NR TN FR1 UE requirement for 3MHz CBW.Proposal 5: The reference sensitivity need new define for 3MHz CBW of Bands n256, n255, n254. |
| [**R4-2411856**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411856.zip) | ZTE Corporation, Sanechips | Proposal 1: To use the proposals in Table 2.1 for UE RF requirements for 3 MHz channel bandwidth in FR1-NTN bands. |
| [**R4-2412078**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412078.zip) | vivo | **Proposal 1:** For NR-NTN UE Tx requirements for 3MHz, * No MPR work needed
* Evaluate A-MPR for 3MHz channel bandwidth
* For other Tx requirements (Min/OFF power, OBW, SEM, ACLR), extend them to support 3MHz

**Proposal 2:** For UE Rx requirements for 3MHz, * Define 3MHz REFSENS requirements for bands n256, n255, n254

| Operating Band | SCS kHz | 3MHz(dBm) | 5MHz(dBm) | 10MHz(dBm) | 15MHz(dBm) | 20MHz(dBm) |
| --- | --- | --- | --- | --- | --- | --- |
|  | 15 | -101.7 | -99.5 | -96.3 | -94.5 | -93.8 |
| n256 | 30 |  |  | -96.6 | -94.6 | -94.0 |
|  | 60 |  |  | -97.0 | -94.9 | -94.2 |
|  | 15 | -102.2 | -100.0 | -96.8 | -95.0 | -93.8 |
| n255 | 30 |  |  | -97.1 | -95.1 | -94.0 |
|  | 60 |  |  | -97.5 | -95.4 | -94.2 |
|  | 15 | -101.7 | -99.5 | -96.3 | -94.5 |  |
| n254 | 30 |  |  | -96.6 | -94.6 |  |
|  | 60 |  |  | -97.0 | -94.9 |  |

| **Operating band / SCS (kHz) / Channel bandwidth (MHz) / Duplex mode** |
| --- |
| **Operating Band** | **SCS** | **3** | **5** | **10** | **15** | **20** | **Duplex Mode** |
|  | 15 | 15 | 25 | 50 | 75 | 100 |  |
| n256 | 30 |  |  | 24 | 36 | 50 | FDD |
|  | 60 |  |  | 10 | 18 | 24 |  |
|  | 15 | 15 | 25 | 50 | 75 | [75] |  |
| n255 | 30 |  |  | 24 | 36 | [36] | FDD |
|  | 60 |  |  | 10 | 18 | [18] |  |
|  | 15 | 15 | 25 | 50 | 75 |  |  |
| n254 | 30 |  |  | 24 | 36 |  | FDD |
|  | 60 |  |  | 10 | 18 |  |  |

* For other Rx requirements (Maximum input level, ACS, blocking…), extend them to support 3MHz
 |
| [**R4-2412435**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412435.zip) | Huawei, HiSilicon | Proposal 1: In Table 1 a summary of TS 38.101-5 sections which are impacted or unimpacted by introduction of 3MHz CBW, is provided. |
| [**R4-2412530**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412530.zip) | Samsung | Proposal 1: For A-MPR and corresponding regulation requirements, further update and evaluation work required if 3MHz need to be applied:* + Band n254: NS\_03N, NS\_04N and NS\_05N
	+ Band n256: NS\_24
	+ Band n255: NS\_02N (no A-MPR required)

Proposal 2: 3MHz CHBW need to be added into section 6.3.1 and 6.3.2 without change on the requirements.Proposal 3: For 6.5.1 Occupied bandwidth, 3MHz CHBW need to added into table without change on the requirement.Proposal 4: For 6.5.2 out of band emission:* + 3MHz CHBW need to be added into ACLR table without change on requirements
	+ General emission mask needs to be update with 3MHz CHBW as similar changes for breaking point from TN TS 38.101-1

Proposal 5: For 6.5.3 Spurious emission: FOOB need to be updated to add 3MHz CHBW with 6MHz boundary.Proposal 6: For 7.3 Reference sensitivity, new requirements for 3MHz need be specified for reference sensitivity on band n256, n255 and n254: * + 2.2 dB offset can be applied based on existing 5MHz requirements

Proposal 7: For 7.4 Maximum input level and 7.7 Spurious response: 3MHz CHBW need to be added into table without change on the requirements.Proposal 8: For 7.5 ACS, 3MHz CHBW need to be added into table without change on the requirements. * + The interference signal configuration also needs to be updated with CHBW 3MHz and offset.

Proposal 9: For 7.6 blocking requirements, following changes required:* + For in-band blocking, add 3MHz CHBW into table and interference frequency offset need to be updated.
	+ For out of band blocking, 3MHz CHBW need to be added into table without change on the requirements.
	+ For narrow band blocking, 3MHz CHBW added into table with Pw as 18dBw.
 |
| [**R4-2413362**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413362.zip) | Ericsson India Private Limited | Proposal 1: As the starting point, consider the Tx and Rx RF requirements specified for 3 MHz channel bandwidth for TN UE wherever possible, as presented in Table 1 and Table 2 of this contribution. |

## 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 UE Tx requirements

*Sub-topic description:*

*Open issues and candidate options before meeting:*

**Issue 2-1-1: UE maximum output power**

* Proposals
	+ Option 1: No specification impact. (ZTE, Huawei)
	+ Option 2: Study whether need introduce 3MHz CBW for n254 in Table 6.2.1-2: Additional requirements for transmit power density (Xiaomi, Ericsson)
* Recommended WF
	+ TBD

**Issue 2-1-2: MPR**

* Proposals
	+ Option 1: No specification impact. (CATT, Xiaomi, ZTE, vivo, Huawei)
	+ Option 2: Study whether Pi/2 BPSK edge allocation needs to be increased to 1dB as for 3MHz CBW for TN. (Ericsson)
* Recommended WF
	+ TBD

**Issue 2-1-3: A-MPR**

* Proposals
	+ Option 1: Introduce 3 MHz channel bandwidth and A-MPR requirements for all NTN network signalling values. (CATT)
	+ Option 2: Operators need figure out which NS values need introduce 3MHz CBW, then RAN4 discuss how to define A-MPR. (Xiaomi)
	+ Option 3: Considering the NR-NTN bands n255, n256, and n254, these bands need A-MPR study. (ZTE)
* NS\_01, NS\_02N: 3 MHz shall be added to the list of considered channel BW for the NS.
* NS\_24, NS\_03N, NS\_04N, NS\_05N: A-MPR shall be specified for 3 MHz channel bandwidth.
* NS\_100 is not dependent on the considered channel BW.
	+ Option 4: Evaluate A-MPR for 3MHz channel bandwidth for some specific NS values. (vivo)
	+ Option 5: 3MHz needs to be added for all NSs (Huawei)
* NS\_01: 3 MHz shall be added to the list of considered channel BW for the NS.
* NS\_24: A-MPR for 3MHz is not needed. NS\_24 for LTE is not applied for 3MHz CBW, neither
* NS\_02N, NS\_03N, NS\_04N, NS\_05N: A-MPR for 3MHz should be studied
* NS\_100 is not dependent on the considered channel BW.
	+ Option 6: For A-MPR and corresponding regulation requirements, further update and evaluation work required if 3MHz need to be applied: (Samsung)
* Band n254: NS\_03N, NS\_04N and NS\_05N
* Band n256: NS\_24
* Band n255: NS\_02N (no A-MPR required)
	+ Option 7: For the NS applicable to bands n256, n255 and n254, the following impacts have been identified: (Ericsson)
* NS\_01, NS\_24, NS\_02N, NS\_03N, NS\_05N: 3 MHz shall be added to the list of channel BWs.
* NS\_100: No impact identified.
* NS\_04N: it should be studied whether 3 MHz should be added.
* Recommended WF
	+ TBD

**Issue 2-1-4: Minimum output power/ Transmit OFF power**

* Proposals
	+ Option 1: Reuse the 3MHz requirements of NR TN FR1 UE: (CATT, Xiaomi, ZTE, Huawei, Samsung, Ericsson)
		- Minimum output power: -40dBm with the measurement bandwidth 2.715 MHz
		- Transmit OFF power: -50dBm with the measurement bandwidth 2.715 MHz
* Recommended WF
	+ Option 1

**Issue 2-1-5: Occupied bandwidth**

* Proposals
	+ Option 1: Addition of 3 MHz into Table 6.5.1-1 in TS 38.101-5. (CATT, Xiaomi, ZTE, vivo, Huawei, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-1-6: Spectrum emissions mask**

* Proposals
	+ Option 1: Reuse the 3MHz requirements of NR TN FR1 UE: (Xiaomi, ZTE, vivo, Huawei, Samsung, Ericsson)
	+ Option 2: Introduce new spectrum emissions limit for 3 MHz CBW (CATT)
* Recommended WF
	+ TBD

**Issue 2-1-7: Additional spectrum emissions mask**

* Proposals
	+ Option 1: No specification impact. (Xiaomi, ZTE, vivo, Huawei)
	+ Option 2: Further evaluate. (CATT)
* Recommended WF
	+ TBD

**Issue 2-1-8: NR ACLR**

* Proposals
	+ Option 1: Addition of 3 MHz into Table 6.5.2.4.1-1 in TS 38.101-5. (CATT, Xiaomi, ZTE, vivo, Huawei, Samsung, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-1-9: General spurious emission**

* Proposals
	+ Option 1: Reuse the TN UE approach for 3 MHz channel bandwidth correspondingly FOOB (6 MHz) (CATT, ZTE, Huawei, Samsung, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-1-10: Additional spurious emissions**

* Proposals
	+ Option 1: Introduce 3 MHz channel bandwidth for all network signalling values (CATT)
	+ Option 2: for NS\_02N, NS\_03N and NS\_04N, 3 MHz needs to be listed (Huawei).
	+ Option 3: Depends on which NS values need introduce 3MHz CBW. (Xiaomi)
* Recommended WF
	+ TBD

**Issue 2-1-11: Spurious emissions for UE co-existence**

* Proposals
	+ Option 1: No specification impact. (Xiaomi, ZTE, Huawei)
	+ Option 2: Further studied (Ericsson)
* Recommended WF
	+ TBD

**Issue 2-1-12: Other Tx requirements**

* Proposals
	+ Option 1: No specification impact for below Tx requirements. (Xiaomi, ZTE, Huawei, Ericsson)

|  |
| --- |
| 6.2.4 Configured transmitted power |
| 6.3.3 Transmit ON/OFF time mask |
| 6.3.4 Power control |
| 6.4.1 Frequency error |
| 6.4.2 Transmit modulation quality |
| 6.5.2.4.2 UTRA ACLR |
| 6.5.4 Transmit intermodulation |

* Recommended WF
	+ Option 1

### Sub-topic 2-2 UE Rx requirements

*Sub-topic description:*

*Open issues and candidate options before meeting:*

**Issue 2-2-1: Reference sensitivity**

* Proposals
	+ Option 1: Define new REFSENS requirement for 3 MHz channel bandwidth. (CATT, Xiaomi, Ericsson)
	+ Option 2: If SU is same as TN 3MHz then the scaling factor of 2.2dB from 5MHz REFSENS for 3MHz can be reused. (ZTE, vivo, Samsung)
	+ Option 3: Two antenna port reference sensitivity QPSK PREFSENS for FDD bands with 15 RB UL configuration. (Huawei)

| Operating band / SCS / Channel bandwidth |
| --- |
| Operating Band | SCS kHz | 3MHz(dBm) |
|  | 15 | -101.7 |
| n256 | 30 |  |
|  | 60 |  |
|  | 15 | -102.1 |
| n255 | 30 |  |
|  | 60 |  |
|  | 15 | -101.7 |
| n254 | 30 |  |
|  | 60 |  |
| NOTE：The transmitter shall be set to PUMAX as defined in clause 6.2.4 of 3GPP TS 38.101-1 [5]. |

* Recommended WF
	+ TBD

**Issue 2-2-2: Maximum input level**

* Proposals
	+ Option 1: Reuse the TN UE approach for 3 MHz channel bandwidth (-25dBm). (CATT)
	+ Option 2: Study whether can reuse the requirements for 5MHz, 10MHz, 15MHz and 20MHz of NTN FR1 UE (-40dBm) (Xiaomi)
	+ Option 3: Reuse the requirements for 5MHz, 10MHz, 15MHz and 20MHz of NTN FR1 UE (-40dBm) (ZTE, vivo, Huawei, Samsung, Ericsson)
* Recommended WF
	+ TBD

**Issue 2-2-3: ACS**

* Proposals
	+ Option 1: Introduce new bandwidth and offset of interferer signal for 3 MHz channel bandwidth. (CATT)
	+ Option 2: Reuse the requirements for 5MHz, 10MHz of NTN FR1 UE. (Xiaomi)
	+ Option 3: Reuse 33 dB ACS, add 3MHz into Table 7.5-1, Table 7.5-2 and Table 7.5-3. (ZTE)
	+ Option 4: Reuse 33 dB ACS, add 3MHz into Table 7.5-1 and Table 7.5-3. (Huawei)
	+ Option 5: Reuse 33 dB ACS and considering a 3 MHz interferer BW and 3/-3 interferer offset. (Ericsson, Samsung)
* Recommended WF
	+ TBD

**Issue 2-2-4: In-band blocking**

* Proposals
	+ Option 1: Introduce new bandwidth and offset of interferer signal for 3 MHz channel bandwidth (CATT)
	+ Option 2: Reuse the requirements for 5MHz, 10MHz of NTN FR1 UE. (Xiaomi)
	+ Option 3: Define in-band blocking requirement similar to TN for 3MHz, and add 3MHz into Table 7.6.2-1. (ZTE, Huawei, Ericsson, Samsung)
* Recommended WF
	+ TBD

**Issue 2-2-5: Out-of-band blocking**

* Proposals
	+ Option 1: Define out of band blocking requirement similar to TN for 3MHz (REFSENS + 6.0 dB) (CATT, Xiaomi, ZTE, Huawei, Samsung, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-2-6: Narrow band blocking**

* Proposals
	+ Option 1: Define narrow band blocking requirement similar to TN for 3MHz (-18dB Pw) (CATT, Xiaomi, ZTE, Huawei, Samsung, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-2-7: Spurious response**

* Proposals
	+ Option 1: 3 MHz shall be added in table 7.7-1, same column as for 5 and 10 MHz channel BW (REFSENS + 6.0 dB) (CATT, Xiaomi, ZTE, Huawei, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-2-8: Intermodulation characteristics**

* Proposals
	+ Option 1: No specification impact (same as TS 38.101-1). (CATT, Xiaomi, ZTE, Huawei, Ericsson)
* Recommended WF
	+ Option 1

**Issue 2-2-9: Spurious emissions**

* Proposals
	+ Option 1: No specification impact. (Xiaomi, ZTE, Huawei, Ericsson)
* Recommended WF
	+ Option 1

# Topic #3: CR

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411064**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411064.zip) | CATT | Draft CR for 38.101-5 to introduce system parameters for UE supporting less than 5 MHz channel bandwidth |

## 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:*

*Open issues and candidate options before meeting:*

**Issue 3-1: Draft CR R4-2411064**

* Proposals
	+ Option 1: modify and agree the CR
	+ Option 2: FFS
* Recommended WF
	+ TBD