**3GPP TSG-RAN WG4 Meeting # 109 R4-2318126**

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

**Agenda item:** 9.3.6

**Source:** Moderator (Inmarsat)

**Title:** Topic summary for [109][120] IoT\_NTN\_extLband

**Document for:** Information

# Introduction

*This discussion aims at defining the specification parameters for the introduction of MSS Extended L-band for IoT NTN.*

# Topic #1: 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** |
| [**R4-2318362**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318362.zip) | Sony | **Observation 1: Due to the different deployment assumptions, adopting the -30 dBm blocking signal level directly from the ECC report is not feasible.** **Observation 2: the 95% TP metric in the 3GPP ACS might be translated to 17dB SNR degradation.** **Observation 3: the blocking requirements based on EN 301 681 and ECC Report 263 are much more stringent than the existing IBB requirement in 3GPP due to higher blocking signal level, smaller frequency offset, and more stringent SNR degradation.** **Observation 4: It has been proposed to create a new work item (NWI) in ETSI to accommodate NTN requirements in harmonized standards based on ETSI replied information.** **Proposal 1: It is suggested to put the action on capturing the blocking requirements from EN 301 681 and ECC Report 263 on hold until further information from ETSI, considering the UE implementation difficulty and the ongoing discussion in ETSI.** |
| [**R4-2319561**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319561.zip) | ZTE Corporation | **Observation 1:** Introduction of flexible Tx-Rx frequency separation violates the previous agreement with a fixed Tx-Rx frequency separation of -150 MHz.**Proposal 1:** For the Extended L-band, the flexible TX–RX frequency separation should not be supported.**Proposal 2:** For the extended L-band, the reference sensitivity level for eMTC NTN can be defined as Table 2.2-1 and Table 2.2-2 and the reference sensitivity level for NB-IoT can be defined as Table 2.2-3.**Proposal 3:** For the extended L-band, introduce a note declare that UE may experience harmful interference from IMT bands in adjacent frequencies when operating in same geographical area and the specific impact will be introduced after ETSI finish the new WI associated with 3GPP NTN. |
| [**R4-2320180**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320180.zip) | Inmarsat, Viasat | **Observation 1: There are a number of use case scenarios, including for consumer Smartphone (service testing), IoT and logistics, Automotive, Public Safety, Maritime and UAV, where a 5+ km separation from a TN base station cannot be assumed, but the system is expected to work nonetheless.****Proposal 1: For the extended L-band, add an LTE blocking scenario to the relevant in-band blocking sections of the 3GPP specification as proposed in Table 2. The lower edge of the victim’s NTN channel is assumed to be at 1520 MHz when a 5MHz LTE interferer placed between 1512MHz and 1517MHz (-30dBm) is applied.****Proposal 2: review the blocking allowance against a 5MHz LTE interferer placed between 1512MHz and 1517MHz (-30dBm) in light of available link margin from link budget. A change, if necessary, may be applied to the relevant in-band blocking sections of the 3GPP specification.****Proposal 3: In line with Proposal 1 and Proposal 2, similarly apply additional in-band blocking requirements as follows in Table 3:****Proposal 4:** **rephrase wording in 7.6.2 Out-of-band blocking in TS 36.102 to allow the inclusion of an 20MHz LTE interferer placed between 1492MHz and 1512MHz (-20dBm) (see blocking scenario 2 in Table 1 of this document).****Proposal 5: review the blocking allowance against a 20MHz LTE interferer placed between 1492MHz and 1512MHz (-20dBm) in light of available link margin from link budget. A change, if necessary, may be applied to the out-of-band blocking sections of the 3GPP specification**.**Proposal 6:** **For the extended L-band, add an LTE blocking scenario to the relevant out-of-band blocking sections of the 3GPP specification as proposed in Table 4. The lower edge of the victim’s NTN channel is assumed to be at 1518 MHz when a 20MHz LTE interferer placed between 1492MHz and 1512MHz (-20dBm) is considered.** **Proposal 7: Proposal 5 and Proposal 6 can be similarly applied to Table 7.6.2B-1: Out-of-band blocking parameters for category NB1 and NB2 UE of TS 36.102 as follows in Table 5.** |
| [**R4-2320646**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320646.zip) | Qualcomm Inc. | **Observation 1: 3GPP co-existence study assumptions differ from ECC report 263, where NTN UE performance was being evaluated anywhere within IMT coverage.** **Observation 2: 3GPP should address the potential co-existence concern due to narrow frequency offset to IMT, but consider also 3GPP co-existence study assumptions and outcomes.****Proposal 1: To address the potential co-existence issue between TN networks and extended L-band DL, specify the IBB2 requirement of -44 dBm interferer signal power level to extend until offsets down to 1 MHz from lower edge of extended L-band, i.e. 1517 MHz.** |

## 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:*

*Open issues and candidate options before meeting:*

**Issue 1-1: TX-RX Frequency Separation**

* Proposals
	+ Option 1: For the Extended L-band, the flexible TX–RX frequency separation should not be supported.
	+ Option 2: Other
* Recommended WF
	+ As per online discussion in previous meeting, this aspect should be addressed in general for all IoT NTN bands as part of AI 6.2.4.1.

Mediatek: if there is demand, this is doable. The motivation is to try to make agreement for all the bands to do it. That is difficult. Flexible separation is optional feature.

**Conclusion:** Stop discussion on this issue in this WI.

**Issue 1-2: REFSENS**

* Proposals
	+ Option 1: For the extended L-band, the reference sensitivity level for eMTC NTN can be defined as Table 2.2-1 and Table 2.2-2 and the reference sensitivity level for NB-IoT can be defined as Table 2.2-3.
* Table 2.2-1: Reference sensitivity for FDD UE category M1 QPSK PREFSENS

|  |  |  |
| --- | --- | --- |
| NTN Band | REFSENS (dBm) | Duplex Mode |
| 253 | -102.7 | FDD |
| NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5- in TS 36.101. |

* Table 2.2-2: Reference sensitivity for HD-FDD UE category M1 QPSK PREFSENS

|  |  |  |
| --- | --- | --- |
| NTN Band | REFSENS (dBm) | Duplex Mode |
| 253 | -103.5 | HD-FDD |
| NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5 in TS 36.101 [7]. |

* Table 2.2-3: Reference sensitivity for UE category NB1 and NB2

|  |  |
| --- | --- |
| Operating band | REFSENS [dBm] |
| According to subclause 5.2B in TS 36.102 | - 108.2 |

* + Option 2: Other
* Recommended WF
	+ TBA

*Agreement:*

* + For the extended L-band, the reference sensitivity level for eMTC NTN can be defined as Table 2.2-1 and Table 2.2-2 and the reference sensitivity level for NB-IoT can be defined as Table 2.2-3.
		- The REFSENS equation will be captured in the TR
* Table 2.2-1: Reference sensitivity for FDD UE category M1 QPSK PREFSENS

|  |  |  |
| --- | --- | --- |
| NTN Band | REFSENS (dBm) | Duplex Mode |
| 253 | -102.7 | FDD |
| NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5- in TS 36.101. |

* Table 2.2-2: Reference sensitivity for HD-FDD UE category M1 QPSK PREFSENS

|  |  |  |
| --- | --- | --- |
| NTN Band | REFSENS (dBm) | Duplex Mode |
| 253 | -103.5 | HD-FDD |
| NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5 in TS 36.101 [7]. |

* Table 2.2-3: Reference sensitivity for UE category NB1 and NB2

|  |  |
| --- | --- |
| Operating band | REFSENS [dBm] |
| According to subclause 5.2B in TS 36.102 | - 108.2 |

### Sub-topic 1-2

*Sub-topic description*

*Open issues and candidate options before meeting:*

**Issue 1-2-1: In-Band Blocking Requirements for Cat M1**

* Proposals
	+ Option 1: It is suggested to put the action on capturing the blocking requirements from EN 301 681 and ECC Report 263 on hold until further information from ETSI, considering the UE implementation difficulty and the ongoing discussion in ETSI.
	+ Option 2:
		- For the extended L-band, add an LTE blocking scenario to the relevant in-band blocking sections of the 3GPP specification as proposed in Table 2. The lower edge of the victim’s NTN channel is assumed to be at 1520 MHz when a 5MHz LTE interferer placed between 1512MHz and 1517MHz (-30dBm) is applied.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| * E-UTRA band
 | Parameter | Unit | Case 1 | Case 2 | Case 34 |
| PInterferer | dBm | -56 | -44 | -30 |
| FInterferer (offset) | MHz | =-BW/2 – FIoffset,case 1&=+BW/2 + FIoffset,case 1 | ≤-BW/2 – FIoffset,case 2&≥+BW/2 + FIoffset,case 2 | N/A |
| 256, 255 | FInterferer | MHz | (NOTE 2) | FDL\_low – 15toFDL\_high + 15 | N/A |
| 2535 | FInterferer | MHz | (NOTE 2) | FDL\_low – 15toFDL\_high + 15 | 1514.5 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive bandNOTE 2: For each carrier frequency the requirement is valid for two frequencies:a. the carrier frequency -BW/2 – FIoffset, case 1 andb. the carrier frequency +BW/2 + FIoffset, case 1NOTE 3: FInterferer range values for unwanted modulated interfering signal are interferer center frequencies NOTE 4: The Interferer bandwidth for Case 3 is a 5 MHz broadband signal interferer (LTE)NOTE 5: The lower edge of the victim’s NTN channel is assumed to be at 1520 MHz |

Table 2 - In-band blocking for Cat M1

* + - Review the blocking allowance against a 5MHz LTE interferer placed between 1512MHz and 1517MHz (-30dBm) in light of available link margin from link budget. A change, if necessary, may be applied to the relevant in-band blocking sections of the 3GPP specification
	+ Option 3: To address the potential co-existence issue between TN networks and extended L-band DL, specify the IBB2 requirement of -44 dBm interferer signal power level to extend until offsets down to 1 MHz from lower edge of extended L-band, i.e. 1517 MHz.
* Recommended WF
	+ TBA

Moderator: send LS to ETSI and wait for feedback before defining the requirements.

R&S: There is difficulty for testing.

Sony: We aligned with moderator suggestions. We are not ready to capture any requirement.

Qualcomm: We are also to ask ETSI how to address it. When we send LS, we should also describe the 3GPP plan.

Ericsson: we are fine with the way forward. We suggest to capture the note in the TS that there is something on-going with regulation.

Agreement:

* Put the action on capturing the blocking requirements from EN 301 681 and ECC Report 263 on hold until further information from ETSI, considering the UE implementation difficulty and the ongoing discussion in ETSI.
	+ Send LS to ETSI to show the discrepancy and applicability to device types
	+ Add the note in the TS and TR that the requirements would be defined after the feedback of ETSI is received.

**Issue 1-2-2: In-Band Blocking Requirements for Cat NB1 NB2**

* Proposals
	+ Option 1: It is suggested to put the action on capturing the blocking requirements from EN 301 681 and ECC Report 263 on hold until further information from ETSI, considering the UE implementation difficulty and the ongoing discussion in ETSI.
	+ Option 2: In line with Proposal 1 and Proposal 2, similarly apply additional in-band blocking requirements as follows in Table 3**:**

|  |
| --- |
| IBB3 test Parameters |
| Category NB1 or NB2 signal power(Pwanted ) / dBm | REFSENS + [6 dB]1 |
| Interferer | E-UTRA |
| Interferer signal power(PInterferer ) / dBm  | - 30 dBm |
| Interferer bandwidth | 5 MHz |
| Interferer centre frequency / MHz | 1514.5 |
| NOTE 1: Values in square brackets may be subject to change pending review |

* Table 3 - Additional in-band blocking parameters for category NB1 and NB2
	+ Option 3: To address the potential co-existence issue between TN networks and extended L-band DL, specify the IBB2 requirement of -44 dBm interferer signal power level to extend until offsets down to 1 MHz from lower edge of extended L-band, i.e. 1517 MHz.
* Recommended WF
	+ TBA

**Issue 1-2-2: Out-of-Band Blocking Requirements for Cat M1**

* Proposals
	+ Option 1: It is suggested to put the action on capturing the blocking requirements from EN 301 681 and ECC Report 263 on hold until further information from ETSI, considering the UE implementation difficulty and the ongoing discussion in ETSI.
	+ Option 2:
		- Rephrase wording in 7.6.2 Out-of-band blocking in TS 36.102 to allow the inclusion of an 20MHz LTE interferer placed between 1492MHz and 1512MHz (-20dBm) (see blocking scenario 2 in Table 1 of this document).
		- Review the blocking allowance against a 20MHz LTE interferer placed between 1492MHz and 1512MHz (-20dBm) in light of available link margin from link budget. A change, if necessary, may be applied to the out-of-band blocking sections of the 3GPP specification
		- For the extended L-band, add an LTE blocking scenario to the relevant out-of-band blocking sections of the 3GPP specification as proposed in Table 4. The lower edge of the victim’s NTN channel is assumed to be at 1518 MHz when a 20MHz LTE interferer placed between 1492MHz and 1512MHz (-20dBm) is considered
* Table 4 – Out of band blocking requirements for Cat M1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Band | Parameter | Unit | Range 1 | Range 2 | Range 3 | Range 42 |
|  | Pinterferer | dBm | -44 | -30 | -15 | -20 |
| 255 | Finterferer (CW) | MHz | -60 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60or60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85orFDL\_high + 85 ≤ f≤ 12750 | N/A |
| 2561 | Finterferer (CW) | MHz | -100 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -145 < f – FDL\_low ≤ -100or60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 145orFDL\_high + 85 ≤ f≤ 12750 | N/A |
| 2533 | Finterferer (LTE) | MHz | N/A | N/A | N/A | 1502 |
| NOTE 1: Band 256 lower frequency ranges are modified to enable specific implementations.NOTE 2: The Interferer bandwidth for Range 4 is a 20 MHz broadband signal interferer (LTE)NOTE 3: The lower edge of the victim’s NTN channel is assumed to be at 1518 MHz |

* Recommended WF
	+ TBA

Qualcomm: out-of-band requirements are new. We are not ready to agree on it.

Sony: WI can be closed without it.

Agreement:

* Do not define the out-of-band blocking requirements in Rel-18
	+ Further discuss it, if needed, in the future release in TEI or WI

**Issue 1-2-3: Out-of-Band Blocking Requirements for Cat NB1 NB2**

* Proposals
	+ Option 1: It is suggested to put the action on capturing the blocking requirements from EN 301 681 and ECC Report 263 on hold until further information from ETSI, considering the UE implementation difficulty and the ongoing discussion in ETSI.
	+ Option 2: Proposal 5 and Proposal 6 can be similarly applied to Table 7.6.2B-1: Out-of-band blocking parameters for category NB1 and NB2 UE of TS 36.102 as follows in Table 5.
* Table 5 - Out of band blocking for Cat NB1 and NB2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Band | Parameter | Unit | Range 1 | Range 2 | Range 3 | Range 45 |
| Pwanted | dBm | REFSENS + 6 dB | REFSENS + [6 dB]6 |
| Pinterferer | dBm | -44 | -30 | -153 | -20 |
| 255 | Finterferer (CW) | MHz | -60 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60or60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85orFDL\_high + 85 ≤ f≤ 12750 | N/A |
| 2562 | Finterferer (CW) | MHz | -100 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -145 < f – FDL\_low ≤ -100or60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 145orFDL\_high + 85 ≤ f≤ 12750 | N/A |
| 2537 | Finterferer (LTE) | MHz | N/A | N/A | N/A | 1502 |
| NOTE 1: The transmitter shall be set to 4dB below PCMAX\_L at the minimum uplink configuration specified in Table 7.3.1-2 in TS 36.101 with PCMAX\_L as defined in subclause 6.2.5.NOTE 2: Band 256 lower frequency ranges are modified to enable specific implementations.NOTE 3: For operating bands which downlink band frequency range is between 1475.9 MHz < f < 2690 MHz the power level of the interferer (PInterferer) for Range 3 shall be modified to: -20 dBm for the frequency range which is bounded by FDL\_low- 200 MHz of the lowest band that UE supports in frequency range 1475.9 MHz < f < 2690 MHz and FDL\_high + 200 MHz of the highest band that UE supports in frequency range 1475.9 MHz < f < 2690 MHz.”NOTE 4: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 2800 MHz and FInterferer < 4400 MHz.NOTE 5: The Interferer bandwidth for Range 4 is a 20 MHz broadband signal interferer (LTE)NOTE 6: Values in square brackets may be subject to changeNOTE 7: The lower edge of the victim’s NTN channel is assumed to be at 1518 MHz |

* Recommended WF
	+ TBA