**3GPP TSG-RAN WG4 Meeting # 107 R4-2310448**

**Incheon, KR, May 22nd – May 26th, 2023**

**Agenda item:** 8.27.6

**Source:** THALES

**Title:** Topic summary for [107][309] NR\_NTN\_enh\_Part1

**Document for:** Information

# Introduction

This discussion summary document captures general issues related to NTN system parameters, regulatory information for Rel-18 NR\_NTN\_enh WI. It contains a summary of the contributions under sections and subsections of Agenda Items 8.27.1 at TSG-RAN WG4#107, together with identified topics/proposals/options for discussion during the meeting.

Please also note the draft TSG-RAN WG4 #107 meeting agenda with respect to NTN topic. The Agenda Items (AIs) considered in this Topic summary for [107][309] NR\_NTN\_enh\_Part1 are:

-------------------------------------- Items led by other working group ----------------------------------------------------

8.27 NR NTN enhancement [NR\_NTN\_enh]

8.27.1 General and work plan [NR\_NTN\_enh-Core]

8.27.1.1 System parameters [NR\_NTN\_enh-Core]

\* Include band definition

8.27.1.2 Regulatory information [NR\_NTN\_enh-Core]

8.27.1.3 Others [NR\_NTN\_enh-Core]

\* R1-2304094 LS on PUSCH DMRS bundling for NR NTN coverage enhancement

(please see **LS in**: RAN4 document R4-2307006)

8.27.2 Co-existence study for above 10GHz bands [NR\_NTN\_enh-Core]

8.27.3 SAN RF requirements [NR\_NTN\_enh-Core]

8.27.4 UE RF requirements [NR\_NTN\_enh-Core]

8.27.5 RRM core requirements [NR\_NTN\_enh-Core]

8.27.6 Moderator summary and conclusions [NR\_NTN\_enh]

With the following pre-meeting deadlines:

* Before May 15 (Monday): Session chairs will provide the list of topics with moderator assignments.
* May 17 (Wednesday), 17:00 UTC: Moderators provide the initial summary for a topic
* May 18 (Thursday), 17:00 UTC: Deadline for companies review of initial summary
* May 19 (Friday), 17:00 UTC: Moderators submit the formal tdoc of summary for a topic
* May 21 (Sunday): Session chairs share the initial meeting notes taking moderators summary in consideration

And the following pre-meeting and meeting schedule:



The following documents are considered for discussion in [107][309] NR\_NTN\_enh\_Part1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***TDoc Number*** | ***TDoc Type*** | ***Title*** | ***Company/Source*** | ***General Purpose*** | ***Agenda Item*** |
| [R4-2309182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309182.zip) | other | Further discussion on system parameter for NTN in Ka band | ZTE Corporation | Approval | 8.27.1.1 |
| [R4-2307392](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307392.zip) | discussion | Discussion on NTN system parameters | CATT | Approval | 8.27.1.1 |
| [R4-2307318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307318.zip) | other | Discussion on above 10GHz NTN bands | Nokia, Nokia Shanghai Bell | Approval | 8.27.1.1 |
| [R4-2307046](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307046.zip) | discussion | Discussion on system parameters for above 10 GHz | NYCU | Discussion | 8.27.1.1 |
| [R4-2308535](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308535.zip) | other | NTN enhancement: System parameters | Ericsson | Approval | 8.27.1.1 |
| [R4-2307006](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307006.zip) | LS in | LS on PUSCH DMRS bundling for NR NTN coverage enhancement | RAN1 | Information | 3 |

The current list of topics/sub-topics/issues prior to the meeting is:

* **Topic #1:** System parameters

\* Include band definition

* + Sub-topic 1-1: Above 10 GHz NTN band definition and related parameters
		- Issue 1-1-1: NTN frequency range(s) NOTE 1
		- Issue 1-1-2: NTN frequency range(s) NOTE 2
		- Issue 1-1-3: NTN frequency range(s) extension
		- Issue 1-1-4: Implications on RAN1 design/TUs request at RAN for FR2-NTN
		- Issue 1-1-5: Tx-Rx frequency separation
	+ Sub-topic 1-2: Lower SCS for smaller CBW
		- Issue 1-2-1: CBW and frequency range details
		- Issue 1-2-2: Relationship with WI scope
	+ Sub-topic 1-3: Channel raster and synchronization raster
		- Issue 1-3-1: NR-ARFCN
		- Issue 1-3-2: GSCN
	+ Sub-topic 1-4: LS in from RAN1
		- Issue 1-4-1: LS in from RAN1

# 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** |
| [R4-2309182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309182.zip) | ZTE Corporation | **Observation 1:** the legacy restriction for Tx-Rx carrier center frequency separation might be not needed if there are no filtering or duplex between Ka-band DL and UL.**Proposal 1:** to use following NR-ARFCN in the Table 2.3-1/2.3-2 for NTN Ka-band.

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplink range of NREF(First – <Step size> – Last) | Downlink range of NREF(First – <Step size> – Last) |
| n512 | [60] | 2070833 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | [120] | 2070833 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n511 | [60] | 2084999 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | [120] | 2084999 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n510 | [60] | 2070833 – <1> – 2084999 | 1553334 – <4> – 1746666 |
|  | [120] | 2070833 – <2> – 2084999 | 1553334 – <8> – 1746664 |

**Proposal 2:** to use following GSCN for Ka-band as followingTable 4: Applicable SS raster entries per *operating band* (FR2-NTN)

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n511 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n510 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

 |
| [R4-2307392](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307392.zip) | CATT | For NREF values,**Table 1: Applicable NR-ARFCN per *operating band***

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplinkrange of NREF(First – <Step size> – Last) | Downlinkrange of NREF(First – <Step size> – Last) |
| n512 | 60 | 2070833 – <1> – 2112499 | 1553334 – <4> – 1746666 |
| 120 | 2070833 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n511 | 60 | 2084999 – <1> –2112499 | 1553334 – <4> – 1746666 |
| 120 | 2084999 – <2> –2112499 | 1553334 – <8> – 1746664 |
| n510 | 60 | 2070833 – <1> – 2084999 | 1553334 – <4> – 1746666 |
| 120 | 2070833 – <2> – 2084999 | 1553334 – <8> – 1746664 |

**Proposal 1: Agree Table 1 which is the agreed starting point in last meeting.**For SS raster entriesTable 2: Applicable SS raster entries per *operating band*

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| n511 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| n510 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

**Proposal 2: Agree Table 2 which is the agreed starting point in last meeting.**For lower SCS for smaller CBW,**Observation 1: The lower SCS support for FR2 range should be discussed and decided by RAN1 such as the phase noise impact, etc.****Observation 2: 60 kHz SCS may support smaller CBW if current raster structure can be reused.****Proposal 3: The detail request for the lower SCS for smaller CBW, such as the CBW and frequency range, should be provided before the further discussion.****Proposal 4: The relationship of this proposal and the WI scope should be clarified.** |
| [R4-2307318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307318.zip) | Nokia, Nokia Shanghai Bell | ***Observation 1: All the currently agreed new NTN bands above 10 GHz correspond to regulations only defined for a specific region/country.******Observation 2: The prerequisite for any new band to be treated by RAN4 is that regulations for the intended region/country of deployment are available and presented to RAN4.******Observation 3: From the proposed Table 5-1-1 it is noted that the wording of Note 1 and Note 2 may need further discussion.******Observation 4: In FR2-NTN the intention of RAN4 is to support at least 60kHz and 120kHz SCS.******Proposal 1: RAN4 shall consider if the agreements on system parameters for FR2-NTN have implication on the RAN1 design and TUs is needed requested at RAN to enable RAN1 asses this.*** |
| [R4-2307046](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307046.zip) | NYCU | **Proposal 1: Remove square bracket of Note 1. That is “NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.”****Proposal 2: Change NOTE 2 to “NOTE 2: NTN bands in this frequency range are considered as belonging to the FR2 band when referenced from other specifications.”****Proposal 3: We support the expansion of frequency ranges and we do not object to including a sub-bullet that specifies the frequency bands.** |
| [R4-2308535](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308535.zip) | Ericsson | **Proposal1: Specify the following channel raster NREF values for bands n512, n511 and n510.**

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplinkrange of NREF(First – <Step size> – Last) | Downlinkrange of NREF(First – <Step size> – Last) |
| n512 | 60 | 2070833 – <1> – 2112499 | 1553336 – <4> – 1746664 |
| 120 | 2070833 – <2> – 2112499 | 1553336 – <8> – 1746664 |
| n511 | 60 | 2084999 – <1> –2112499 | 1553336 – <4> – 1746664 |
| 120 | 2084999 – <2> –2112499 | 1553336 – <8> – 1746664 |
| n510 | 60 | 2070833 – <1> – 2084999 | 1553336 – <4> – 1746664 |
| 120 | 2070833 – <2> – 2084999 | 1553336 – <8> – 1746664 |

**Proposal2: Specify n512, n511 and n510 synchronization raster entries according to following table:**

|  |  |  |  |
| --- | --- | --- | --- |
| NTN *operating band* | SS Block SCS | SS Block pattern | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472 – <24> – 19416 |
| n511 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472 – <24> – 19416 |
| n510 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472 – <24> – 19416 |

 |
| [R4-2309182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309182.zip) | ZTE Corporation | **Observation 1:** the legacy restriction for Tx-Rx carrier center frequency separation might be not needed if there are no filtering or duplex between Ka-band DL and UL.**Proposal 1:** to use following NR-ARFCN in the Table 2.3-1/2.3-2 for NTN Ka-band.

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplink range of NREF(First – <Step size> – Last) | Downlink range of NREF(First – <Step size> – Last) |
| n512 | [60] | 2070833 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | [120] | 2070833 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n511 | [60] | 2084999 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | [120] | 2084999 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n510 | [60] | 2070833 – <1> – 2084999 | 1553334 – <4> – 1746666 |
|  | [120] | 2070833 – <2> – 2084999 | 1553334 – <8> – 1746664 |

**Proposal 2:** to use following GSCN for Ka-band as followingTable 4: Applicable SS raster entries per *operating band* (FR2-NTN)

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n511 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n510 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

 |

## 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:* Above 10 GHz NTN band definition and related parameters

*Open issues and candidate options before meeting:*

**Issue 1-1-1:** NTN frequency range(s) NOTE 1

* Proposals
	+ Option 1: **Remove square bracket of Note 1. That is “NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.”** (P1/R4-2307046)
	+ Option 2: ***the wording of Note 1 may need further discussion.*** (O3/R4-2307318)
* Recommended WF
	+ TBA

**Issue 1-1-2:** NTN frequency range(s) NOTE 2

* Proposals
	+ Option 1: **Change NOTE 2 to “NOTE 2: NTN bands in this frequency range are considered as belonging to the FR2 band when referenced from other specifications.”** (P2/R4-2307046)
	+ Option 2: **Remove square bracket of NOTE 2. That is “NTN bands within this frequency range are regarded as a FR2 band when references from other specifications.”**
	+ Option 3: ***the wording of Note 2 may need further discussion.*** (O3/R4-2307318)
* Recommended WF
	+ TBA

**Issue 1-1-3:** NTN frequency range(s) extension

* Proposals
	+ Option 1: **Support the expansion of frequency ranges and do not object to including a sub-bullet that specifies the frequency bands.** (P2/R4-2307046)
	+ Option 2: TBA
* Recommended WF
	+ TBA

**Issue 1-1-4:** Implications on RAN1 design/TUs request at RAN for FR2-NTN

* Proposals
	+ Option 1: ***RAN4 shall consider if the agreements on system parameters for FR2-NTN have implication on the RAN1 design and TUs is needed requested at RAN to enable RAN1 asses this.*** (P1/R4-2307318)
	+ Option 2: TBA
* Recommended WF
	+ TBA

**Issue 1-1-5:** Tx-Rx frequency separation

* Proposals
	+ Option 1: the legacy restriction for Tx-Rx carrier center frequency separation might be not needed if there are no filtering or duplex between Ka-band DL and UL. (O1/R4-2309182)
	+ Option 2: TBA
* Recommended WF
	+ TBA
	+ Moderator Note: Please note the previous RAN4#106-bis-e previous agreement (R4-2305925, THALES): “Flexible Tx-Rx frequency separation can be used for Ka band NTN FDD operation.”

### Sub-topic 1-2

*Sub-topic description* Lower SCS for smaller CBW

*Open issues and candidate options before meeting:*

**Issue 1-2-1:** CBW and frequency range details

* Proposals
	+ Option 1: **The detail request for the lower SCS for smaller CBW, such as the CBW and frequency range, should be provided before the further discussion.** (P3/R4-2307392)
		- **Note 1: The lower SCS support for FR2 range should be discussed and decided by RAN1 such as the phase noise impact, etc.** (O1/R4-2307392)
		- **Note 2: 60 kHz SCS may support smaller CBW if current raster structure can be reused.** (O2/R4-2307392)
	+ Option 2: TBA
* Recommended WF
	+ TBA

**Issue 1-2-2:** Relationship with WI scope

* Proposals
	+ Option 1: **The relationship of “lower SCS for smaller CBW” proposal and the WI scope should be clarified.** (P4/R4-2307392)
	+ Option 2: TBA
* Recommended WF
	+ TBA

### Sub-topic 1-3

*Sub-topic description* Channel raster and synchronization raster

*Open issues and candidate options before meeting:*

**Issue 1-3-1:** NR-ARFCN

* Proposals
	+ Option 1: to use following NR-ARFCN for NTN Ka-band. (P1/R4-2309182, P1/R4-2307392)

**Table 1: Applicable NR-ARFCN per *operating band***

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplink range of NREF(First – <Step size> – Last) | Downlink range of NREF(First – <Step size> – Last) |
| n512 | 60 | 2070833 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | 120 | 2070833 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n511 | 60 | 2084999 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | 120 | 2084999 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n510 | 60 | 2070833 – <1> – 2084999 | 1553334 – <4> – 1746666 |
|  | 120 | 2070833 – <2> – 2084999 | 1553334 – <8> – 1746664 |

* + Option 2: **Specify the following channel raster NREF values for bands n512, n511 and n510.** (P1/R4-2308535)

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplinkrange of NREF(First – <Step size> – Last) | Downlinkrange of NREF(First – <Step size> – Last) |
| n512 | 60 | 2070833 – <1> – 2112499 | 1553336 – <4> – 1746664 |
| 120 | 2070833 – <2> – 2112499 | 1553336 – <8> – 1746664 |
| n511 | 60 | 2084999 – <1> –2112499 | 1553336 – <4> – 1746664 |
| 120 | 2084999 – <2> –2112499 | 1553336 – <8> – 1746664 |
| n510 | 60 | 2070833 – <1> – 2084999 | 1553336 – <4> – 1746664 |
| 120 | 2070833 – <2> – 2084999 | 1553336 – <8> – 1746664 |

* Recommended WF
	+ TBA
	+ Moderator Note: Option 1 is the WF without [] from previous RAN4#106-bis-e meeting (see R4-2305925, THALES)

**Issue 1-3-2:** GSCN

* Proposals
	+ Option 1: to use following GSCN for Ka-band as following (P2/R4-2309182, P2/R4-2308535 without NOTE 1)

Table 2: Applicable SS raster entries per *operating band* (FR2-NTN)

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n511 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n510 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

* + Option 2: Agree Table 2 “which is the agreed starting point in last meeting”. (P2/R4-2307392)

Table 2: Applicable SS raster entries per *operating band*

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| n511 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| n510 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

* + Option 3: Remove [] from agreed WF at RAN4#106-bis-e (R4-2305925, THALES)

Table 2: Applicable SS raster entries per *operating band*

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17444 – <12> – 19424 |
|  | 240 kHz | Case E | 17456 – <24> – 19400 |
| n511 | 120 kHz | Case D | 17444 – <12> – 19424 |
|  | 240 kHz | Case E | 17456 – <24> – 19400 |
| n510 | 120 kHz | Case D | 17444 – <12> – 19424 |
|  | 240 kHz | Case E | 17456 – <24> – 19400 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

* Recommended WF
	+ TBA

### Sub-topic 1-4

*Sub-topic description* LS in from RAN1

*Open issues and candidate options before meeting:*

**Issue 1-4-1:** LS in from RAN1

* Proposals
	+ Option 1: Acknowledge **Working assumption** from RAN1:
		- For NTN-specific PUSCH DMRS bundling, to satisfy the phase difference limit without causing phase discontinuity, it is assumed that pre-compensation to keep phase rotation due to timing drift within the phase difference limit can be performed at UE side.
			* UE shall not perform TA pre-compensation update within an actual TDW if it causes phase discontinuity that may violate the phase difference limit.
				+ FFS: how to determine the actual TDW
			* FFS: specification impact
	+ Option 2: TBA
* Recommended WF
	+ TBA

# ANNEX with all proposals from [107][309]

|  |  |  |
| --- | --- | --- |
| ***TDoc Number*** | ***Company/Source*** | ***Proposals*** |
| [R4-2309182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309182.zip) | ZTE Corporation | **Observation 1:** the legacy restriction for Tx-Rx carrier center frequency separation might be not needed if there are no filtering or duplex between Ka-band DL and UL.**Proposal 1:** to use following NR-ARFCN in the Table 2.3-1/2.3-2 for NTN Ka-band.

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplink range of NREF(First – <Step size> – Last) | Downlink range of NREF(First – <Step size> – Last) |
| n512 | [60] | 2070833 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | [120] | 2070833 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n511 | [60] | 2084999 – <1> – 2112499 | 1553334 – <4> – 1746666 |
|  | [120] | 2084999 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n510 | [60] | 2070833 – <1> – 2084999 | 1553334 – <4> – 1746666 |
|  | [120] | 2070833 – <2> – 2084999 | 1553334 – <8> – 1746664 |

**Proposal 2:** to use following GSCN for Ka-band as followingTable 4: Applicable SS raster entries per *operating band* (FR2-NTN)

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n511 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| n510 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472– <24> – 19416 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

 |
| [R4-2307392](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307392.zip) | CATT | For NREF values,**Table 1: Applicable NR-ARFCN per *operating band***

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplinkrange of NREF(First – <Step size> – Last) | Downlinkrange of NREF(First – <Step size> – Last) |
| n512 | 60 | 2070833 – <1> – 2112499 | 1553334 – <4> – 1746666 |
| 120 | 2070833 – <2> – 2112499 | 1553334 – <8> – 1746664 |
| n511 | 60 | 2084999 – <1> –2112499 | 1553334 – <4> – 1746666 |
| 120 | 2084999 – <2> –2112499 | 1553334 – <8> – 1746664 |
| n510 | 60 | 2070833 – <1> – 2084999 | 1553334 – <4> – 1746666 |
| 120 | 2070833 – <2> – 2084999 | 1553334 – <8> – 1746664 |

**Proposal 1: Agree Table 1 which is the agreed starting point in last meeting.**For SS raster entriesTable 2: Applicable SS raster entries per *operating band*

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(note 1) | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| n511 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| n510 | 120 kHz | Case D | 17446 – <12> – 19426 |
|  | 240 kHz | Case E | 17447 – <24> – 19415 |
| NOTE 1: SS Block pattern is defined in section 4.1 in TS 38.213. |

**Proposal 2: Agree Table 2 which is the agreed starting point in last meeting.**For lower SCS for smaller CBW,**Observation 1: The lower SCS support for FR2 range should be discussed and decided by RAN1 such as the phase noise impact, etc.****Observation 2: 60 kHz SCS may support smaller CBW if current raster structure can be reused.****Proposal 3: The detail request for the lower SCS for smaller CBW, such as the CBW and frequency range, should be provided before the further discussion.****Proposal 4: The relationship of this proposal and the WI scope should be clarified.** |
| [R4-2307318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307318.zip) | Nokia, Nokia Shanghai Bell | ***Observation 1: All the currently agreed new NTN bands above 10 GHz correspond to regulations only defined for a specific region/country.******Observation 2: The prerequisite for any new band to be treated by RAN4 is that regulations for the intended region/country of deployment are available and presented to RAN4.******Observation 3: From the proposed Table 5-1-1 it is noted that the wording of Note 1 and Note 2 may need further discussion.******Observation 4: In FR2-NTN the intention of RAN4 is to support at least 60kHz and 120kHz SCS.******Proposal 1: RAN4 shall consider if the agreements on system parameters for FR2-NTN have implication on the RAN1 design and TUs is needed requested at RAN to enable RAN1 asses this.*** |
| [R4-2307046](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307046.zip) | NYCU | **Proposal 1: Remove square bracket of Note 1. That is “NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.”****Proposal 2: Change NOTE 2 to “NOTE 2: NTN bands in this frequency range are considered as belonging to the FR2 band when referenced from other specifications.”****Proposal 3: We support the expansion of frequency ranges and we do not object to including a sub-bullet that specifies the frequency bands.** |
| [R4-2308535](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308535.zip) | Ericsson | **Proposal1: Specify the following channel raster NREF values for bands n512, n511 and n510.**

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster(kHz)  | Uplinkrange of NREF(First – <Step size> – Last) | Downlinkrange of NREF(First – <Step size> – Last) |
| n512 | 60 | 2070833 – <1> – 2112499 | 1553336 – <4> – 1746664 |
| 120 | 2070833 – <2> – 2112499 | 1553336 – <8> – 1746664 |
| n511 | 60 | 2084999 – <1> –2112499 | 1553336 – <4> – 1746664 |
| 120 | 2084999 – <2> –2112499 | 1553336 – <8> – 1746664 |
| n510 | 60 | 2070833 – <1> – 2084999 | 1553336 – <4> – 1746664 |
| 120 | 2070833 – <2> – 2084999 | 1553336 – <8> – 1746664 |

**Proposal2: Specify n512, n511 and n510 synchronization raster entries according to following table:**

|  |  |  |  |
| --- | --- | --- | --- |
| NTN *operating band* | SS Block SCS | SS Block pattern | Range of GSCN(First – <Step size> – Last) |
| n512 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472 – <24> – 19416 |
| n511 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472 – <24> – 19416 |
| n510 | 120 kHz | Case D | 17448 – <12> – 19428 |
|  | 240 kHz | Case E | 17472 – <24> – 19416 |

 |
| [R4-2307006](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307006.zip) | RAN1 | **Working assumption**For NTN-specific PUSCH DMRS bundling, to satisfy the phase difference limit without causing phase discontinuity, it is assumed that pre-compensation to keep phase rotation due to timing drift within the phase difference limit can be performed at UE side.* UE shall not perform TA pre-compensation update within an actual TDW if it causes phase discontinuity that may violate the phase difference limit.
	+ FFS: how to determine the actual TDW
* FFS: specification impact

Send an LS to RAN4**To TSG RAN WG4****ACTION**: RAN1 respectfully asks RAN4 to take the above RAN1 observations and working assumption into account. |