**3GPP TSG-RAN WG4 Meeting #112bis R4-2415236**

**Hefei, Anhui, China, 14th – 18th October, 2024**

**Agenda item:** 7.3

**Source:** Moderator (Apple)

**Title:** Topic summary for [112bis][132] NR\_reply\_LS\_UE\_RF

**Document for:** Information

# Introduction

This email thread is focused on the following RF topics under AI 7.

1. Reply to LS on FR2-NTN inclusion to specifications (R1-2407406)

# Topic #1: Reply to LS on FR2-NTN inclusion to specifications (R1-2407406)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2415085 | CATT | RAN4 thanks RAN1 for the LS on FR2-NTN inclusion to specifications in R1-2407406.  RAN4 discussed about impact of LS on RAN1 and RAN2 specificatiions, The NOTE 2 is not required for RAN1 specifications since the FR2-NTN was used in RAN1 specification, but the NOTE 2 is required for RAN2 specifications since the FR2-NTN was not used in RAN2 specifications. So RAN4 needs to update NOTE2 and add an “if applicable” for NOTE 2 in Table 5.1-1 of TS 38.108 and TS 38.101-5 as below:  Table 5.1-1: Definition of NTN frequency ranges   |  |  | | --- | --- | | Frequency range designation | Corresponding frequency range (MHz) | | FR1-NTN (NOTE 1) | 410 – 7125 | | FR2-NTN (NOTE 2) | 17300 – 30000 | | NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.  NOTE 2: NTN bands within this frequency range are regarded as a FR2 band when references from other specifications, if applicable. | | |
| R4-2415086 | CATT | CR to TS 38.101-5 |
| R4-2415087 | CATT | CR to TS 38.108 |
| R4-2415749 | vivo | ***Proposal 1: Reply to RAN1 and RAN2 that the notes in NTN frequency ranges table need to be updated for TS 38.101-1/38.133/38.108:***  ***NOTE 2: NTN bands within this frequency range are regarded as a FR2-1 band when references from other specifications.*** |
| R4-2415750 | vivo | RAN4 would like to thank RAN1 for LS on FR2-NTN inclusion to specification.  RAN4 would like to confirm that NOTE2 in Table 5.1-1 of 38.101-5 needs to be updated. FR2-NTN bands are regarded as FR2-1 bands when references from other specifications. The following change is made to the notes in Table 5.1-1 of 38.101-5:   * Change ‘FR2 band’ to ‘FR2-1 band’ in NOTE 2.   Table 5.1-1: Definition of NTN frequency ranges   |  |  | | --- | --- | | Frequency range designation | Corresponding frequency range | | FR1-NTN(Note 1) | 410 MHz – 7125 MHz | | FR2-NTN(Note 2) | 17300 MHz – 30000 MHz | | NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.  NOTE 2: NTN bands within this frequency range are regarded as a FR2-1 band when references from other specifications. | |   Besides, we also find the similar note specified in Table 8.1C.1-2 in TS 38.133 and Table 5.1-1 in TS 38.108, we believe the same adaptation can be made.  Table 8.1C.1-2: Maximum number of RLM-RS resources NRLM   |  |  |  | | --- | --- | --- | | **Carrier frequency range of PCell** |  | **Maximum number of RLM-RS resources, NRLM** | | FR1, ≤ 3 GHzNote | 4 | 2 | | FR1, > 3 GHzNote | 8 | 4 | | [FR2-NTN]Note 2 | 64 | 8 | | NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 1.88GHz, as specified in clause 4.1 in TS 38.213 [3].  NOTE 2: NTN bands within this frequency range are regarded as a FR2-1 band when references from other specifications. | | |   **Table 5.1-1: Definition of NTN frequency ranges**   |  |  | | --- | --- | | **Frequency range designation** | **Corresponding frequency range (MHz)** | | FR1-NTN (NOTE 1) | 410 – 7125 | | FR2-NTN (NOTE 2) | 17300 – 30000 | | NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.  NOTE 2: NTN bands within this frequency range are regarded as a FR2-1 band when references from other specifications. | | |
| R4-2415751 | vivo | CR to TS 38.101-5 |
| R4-2415752 | vivo | CR to TS 38.108 |
| R4-2415335 | Apple | ***Observation 1****: From the operation without or with “shared spectrum channel access” perspective, FR2-NTN shall follow the FR2-1 procedure.*  ***Observation 2****: From the operation frequency range and the supported numerologies and channel bandwidths perspective, FR2-NTN shall follow the FR2-1 procedure.*    ***Proposal 1****: RAN4 to confirm with RAN1 that FR2-NTN shall follow the FR2-1 procedure.*  ***Observation 3****: FR2-NTN frequency range does not fully correlate with the terrestrial network FR2 nor FR2-1 range, having NOTE 2 referencing to either FR2 or FR2-1 band may cause some confusion.*  ***Proposal 2****: If FR2-NTN frequency range can be confirmed to follow the FR2-1 procedure to RAN1 and RAN2, RAN4 to consider the following two options on the handling of NOTE 2:*  ***Option 1****: Remove NOTE 2 to avoid the potential confusion with FR2 or FR2-1.*  ***Option 2****: Update NOTE 2 to as “NTN bands within this frequency range are to follow FR2-1 band procedure when referenced from other specifications.”* |
| R4-2415336 | Apple | RAN4 thanks RAN1 for the LS on FR2-NTN inclusion to specifications and the inquiry for RAN’4 clarifications on the following two questions:   * RAN1 identified that some RAN1 specifications are still unclear regarding whether FR2-1 or FR2-2 procedure should apply to the FR2-NTN, as the current RAN1 specifications define different behaviour between FR2-1 and FR2-2. * Furthermore, RAN1 understands that NOTE 2 in Table 5.1-1 of 38.101-5 states that FR2-NTN are regarded as FR2 bands, likely to minimize the impact when referencing RAN1 and RAN2 specifications. RAN1 would like to ask RAN4 to consider whether NOTE 2 may need to be updated.   RAN4 has discussed the queries from RAN1 and would like to provide our responses as below:  ***Question 1****: Whether FR2-1 or FR2-2 procedure should apply to the FR2-NTN?*  ***RAN4 answer to question 1****: FR2-NTN shall follow the FR2-1 procedure.*  ***Question 2****: Whether NOTE 2 in Table 5.1-1 of 38.101-5 may need to be updated?*  ***RAN4 answer to question 2****: As FR2-NTN frequency range does not fully correlate with the terrestrial network FR2 nor FR2-1 range, having NOTE 2 referencing to either FR2 or FR2-1 band may cause some confusion. With the confirmation to RAN1 and RAN2 that FR2-NTN shall follow the FR2-1 procedure, RAN4 considers that NOTE 2 is no longer necessary and can be removed to avoid the potential confusion with FR2 or FR2-1.* |
| R4-2416060 | Huawei, HiSilicon | **Observation 1: based on the previous agreements, RAN4 still need some works to update the text proposal of NOTE1 and NOTE 2 in the table 5.1-1 of TS 38.101-5 and TS 38.108.**  **Observation 2: if RAN4 still keep these two NOTEs in RF specification, there is a risk for other working groups that some other features for terrestrial network may automatically apply to the corresponding FR1-NTN/FR2-NTN bands without carefully checking.**  **Proposal 1:** **In order to avoid any confusion and misunderstanding, RAN4 shall remove these two NOTES in the table 5.1-1 of TS 38.101-5 and TS 38.108.**  ***Attached LS:***  RAN4 thanks RAN1 has completed the work on RAN1 specification changes to support NR NTN for the frequency bands defined as part of FR2-NTN and sent LS to RAN4. RAN4 is aware that it’s very difficult and risky to regard FR1-NTN/FR2-NTN bands as FR1/FR2 bands in the other working group’s specification, even if the purpose is to minimize the impact when referencing other working groups’ specifications.  Thus, RAN4 has agreed to remove the “NOTE1 and NOTE2” in the table 5.1-1 of TS 38.101-5 and TS 38.108 below. In order to avoid any confusion and misunderstanding, RAN4 kindly request RAN1 and RAN2 to carefully check the applicability for FR1-NTN/FR2-NTN and clarify them in the corresponding specifications after RAN4 remove these two NOTEs in the table 5.1-1 of TS 38.101-5 and TS 38.108.  Table 5.1-1: Definition of NTN frequency ranges   |  |  | | --- | --- | | Frequency range designation | Corresponding frequency range | | FR1-NTN1 | 410 MHz – 7125 MHz | | FR2-NTN2 | 17300 MHz – 30000 MHz | | NOTE 1: Void.  NOTE 2: Void. | | |
| R4-2416157 | Ericsson | **Proposal: Approve the LS reply to RAN1 in Annex and endorsed our companions draft CRs ([2] and [3]).**  ***Attached LS:***  RAN4 would like to thank RAN1 for their LS R1-2407406.  RAN4 acknowledges that the note 2 in table 5.1-1 should be updated, clarifying that the band should be regarded as a FR2-1 band, and not a FR2-2 one, as highlighted below:  Table 5.1-1: Definition of NTN frequency ranges   |  |  | | --- | --- | | Frequency range designation | Corresponding frequency range | | FR1-NTN(Note 1) | 410 MHz – 7125 MHz | | FR2-NTN(Note 2) | 17300 MHz – 30000 MHz | | NOTE 1: NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.  NOTE 2: NTN bands within this frequency range are regarded as a FR2-1 band when references from other specifications. | |   The attached draft CRs were endorsed and corresponding CRs should be agreed in next RAN4#113 meeting. |
| R4-2416158 | Ericsson | CR to TS 38.101-5 |
| R4-2416159 | Ericsson | CR to TS 38.108 |
| R4-2416187 | Nokia | [Proposal 1: Modify Note 2, in Table 5.1-1 of TS 38.101-5, and adopt the following phrasing: “In other specifications, when FR2-NTN is not explicitly defined, NTN bands within this frequency range are regarded as FR2, or FR2-1 when there is a differentiation between FR2-1 and FR2-2.”](#_Toc178966679)  [Proposal 2: Send this information in LS Reply to RAN1.](#_Toc178966680)  Attached LS:  RAN4 appreciates the information sent by RAN1 and thanks RAN1 for the clarification that the FR2-NTN will be also referenced in TS 38.213.  Regarding the request made by RAN1, RAN4 provides the agreed updated note to be captured in specification:  **Table 5.1-1: Definition of NTN frequency ranges**   |  |  | | --- | --- | | **Frequency range designation** | **Corresponding frequency range** | | FR1-NTN1 | 410 MHz – 7125 MHz | | FR2-NTN2 | 17300 MHz – 30000 MHz | | 1. NOTE 1: [NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.] 2. NOTE 2: In other specifications, when FR2-NTN is not explicitly defined, NTN bands within this frequency range are regarded as FR2, or FR2-1 when there is a differentiation between FR2-1 and FR2-2.” | | |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f 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 f2f meeting:*

**Issue 1-1-1: In RAN1 understanding, FR2-NTN is regarded as FR2-1 when referenced from other specification.**

* Proposals
  + Option 1: Agree
  + Option 2: Disagree
* Recommended WF
  + Agree on Option 1

Huawei: RAN4 can confirm it.

Skyworks: should we say “outside RAN4”.

Huawei: propose to remove two notes and ask other WG to update their spec.

Apple: Support Option 1 to remove note 1 and note 2.

Ericsson: We cannot remove the notes for time being.

Apple: There is another consideration. There is another WI to introduce Ku band. If we introduce this band, we need a new note in the text. How can we do the note in the table.

CHTTL: share the similar view as Ericsson. Regarding Apple, the WI on Ku band should be downseleted either on FR1 or FR2. We may have new note or update the note. Not sure now.

Ericsson: have concern on the LS.

Agreement:

* RAN4 confirms to RAN1 that FR2-NTN follows FR2-1 procedure.

**Issue 1-1-2: Whether and how to modify Note 2 in the table (38.101-5 and 38.105)?**

* Proposals
  + Option 1: Remove both Note 1 and Note 2
  + Option 2: Keep Note 1 and remove Note 2
  + Option 3a: Revise Note 2 (FR2 -> FR2-1)
  + Option 3b: Update NOTE 2 to as “NTN bands within this frequency range are to follow FR2-1 band procedure when referenced from other specifications.”
  + Option 3c: 2 NOTE 2: In other specifications, when FR2-NTN is not explicitly defined, NTN bands within this frequency range are regarded as FR2, or FR2-1 when there is a differentiation between FR2-1 and FR2-2.”
* Recommended WF
  + FFS

Apple: most of companies prefer to keep the note. We have alternative proposal 3b. The correct description. Only simply saying FR2-1 implies that the frequency range is fully aligned. The frequency range between FR2-NTN and FR2-1 are different.