**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-210XXXX**

**Electronic Meeting, 12th – 20th April, 2021**

**Agenda item:** 8.8.1, 8.8.1.1, 8.8.1.2, 8.8.1.3

**Source:** Moderator (THALES)

**Title:** Email discussion summary for [98-bis-e][307] NTN\_Solutions\_Part1

**Document for:** Information

# Introduction

This discussion summary document captures general issues related to RAN4 RF part Rel-17 NR NTN WI, including system parameters, NTN architecture, and regulatory discussions, including exemplary bands. It contains a summary of the contributions under sections and subsections 8.8.1, 8.8.1.1, 8.8.1.2, 8.8.1.3 at TSG-RAN WG4 #98-bis-e, together with identified key open issues and recommends topics/questions to be handled via email discussions. The goal of this document is to provide recommendation on prioritization of discussion.

Please also note the draft TSG-RAN WG4 #98-bis-e meeting agenda with respect to NTN topic:

### 8.8. Solutions for NR to support non-terrestrial networks (NTN) [NR\_NTN\_solutions]

8.8.1 General and work plan [NR\_NTN\_solutions-Core]

\* Include candidate band discussion for FR2

### 8.8.1.1 System parameters [NR\_NTN\_solutions-Core]

### 8.8.1.2 NTN architecture [NR\_NTN\_solutions-Core]

### 8.8.1.3 Regulatory information [NR\_NTN\_solutions-Core]

### 8.8.1.4 Others [NR\_NTN\_solutions-Core]

### 8.8.2 Coexistence aspects [NR\_NTN\_solutions-Core]

### 8.8.2.1 Coexistence scenarios and Simulation assumptions [NR\_NTN\_solutions-Core]

### 8.8.2.2 Simulation results [NR\_NTN\_solutions-Core]

### 8.8.3 RF requirements [NR\_NTN\_solutions-Core]

### 8.8.3.1 Network side requirements [NR\_NTN\_solutions-Core]

### 8.8.3.2 UE requirements [NR\_NTN\_solutions-Core]

### 8.8.4 RRM core requirements [NR\_NTN\_solutions-Core]

### 8.8.4.1 General [NR\_NTN\_solutions-Core]

### 8.8.4.2 Timing requirements [NR\_NTN\_solutions-Core]

### 8.8.4.3 Measurement requirements [NR\_NTN\_solutions-Core]

For informative purpose, RAN4#98-bis-e E-meeting Arrangements and Guidelines proposed the following schedule:

* Stage 1: Moderators kick off email discussion (Monday Apr. 12)
* Stage 2: Companies provide comments for the 1st round (Apr. 12 – Wednesday 8am UTC Apr. 14)
* Stage 3: Moderators summarize the status and possible proposals, recommending what decisions can be made for 1st round. A formal t-doc will be used (Wednesday 11pm UTC, Apr. 14)
* Stage 4: After receiving the summary from moderators, session chair may approve documents, make agreements or assign new CRs, WFs, LSs, etc. (no later than Friday 3pm UTC, Apr. 16)
* Stage 5: Companies provide comments for 2nd round starting from Thursday 8am UTC Apr. 15.
  + - Draft WF/LS and revised CRs/TPs shall be shared by Friday 11pm UTC, Apr. 16.
    - Commenting shall stop by Monday 11pm UTC, Apr. 19.
    - Formal tdocs of WF/LS/CRs/TPs shall be uploaded to the Inbox (except Cat A CRs) by Tuesday 1am UTC, Apr. 20.
* Stage 6: Moderators provide 2nd round summary with a formal tdoc by Tuesday 9am UTC, Apr. 20.
* Stage 7: Session chairs announce close of sessions (no later than 5pm UTC, Apr. 20). Final decisions will be captured in Chairman meeting report (to be shared after the meeting is closed)

A total of **11** TDocs have been identified for this agenda (please also see the **Annex** for the details, with all the observations/proposals):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***TDoc Number*** | ***TDoc Type*** | ***Title*** | ***Company*** | ***Status*** | ***General Purpose*** | ***Agenda Item*** |
| [R4-2104879](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104879.zip) | Work Plan | NR\_NTN\_solutions work plan | THALES | available | Endorsement | 8.8.1 |
| [R4-2107217](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107217.zip) | discussion | On the FR2 NTN coexistence scenarios | Hughes/EchoStar, Inmarsat, Thales, ESA, Intelsat | available | Discussion | 8.8.1 |
| [R4-2107193](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107193.zip) | discussion | On NTN System parameters | Nokia, Nokia Shanghai Bell | available | Approval | 8.8.1.1 |
| [R4-2106607](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106607.zip) | other | Discussion on system parameters for NTN | ZTE Corporation | available | Approval | 8.8.1.1 |
| [R4-2106899](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106899.zip) | other | Reference points and reference model for NTN | Ericsson | available | Approval | 8.8.1.1 |
| [R4-2106608](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106608.zip) | other | Discussion on NTN architecture | ZTE Corporation | available | Approval | 8.8.1.2 |
| [R4-2106545](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106545.zip) | other | Discussion on RF interfaces for NR to support non-terrestrial networks | Xiaomi | available | Approval | 8.8.1.2 |
| [R4-2106686](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106686.zip) | other | Further discussion on Network architecture on NTN system | Huawei, HiSilicon | available | Approval | 8.8.1.2 |
| [R4-2104808](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104808.zip) | discussion | on NTN architecture and RF requirements | CATT | available | Discussion | 8.8.1.2 |
| [R4-2107263](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107263.zip) | discussion | NTN Architecture Aspects | THALES | available | Discussion | 8.8.1.2 |
| [R4-2106897](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106897.zip) | other | NTN - Regulatory and spectrum aspects | Ericsson | available | Approval | 8.8.1.3 |

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: TBA
* 2nd round: TBA

Identified topics and issues for the 1st round:

1. Topic #1: NTN Architecture Aspects
   1. Issue 1-1: Architecture options from RAN4#98e
   2. Issue 1-2: Potential (architecture type) selection process
   3. Issue 1-3: Use architecture as defined by RAN3 as baseline for RAN4
   4. Issue 1-4: Type of connexion between NTN-Gateway and Non-NTN Infrastructure gNB functions
   5. Issue 1-5: <satellite+feeder link+ NTN-gateway> as a RRU, Relay, Repeater
2. Topic #2: Generic Parameters
   1. Issue 2-1: gNB hypotheses for the ground gNB component in NTN
   2. Issue 2-2: NTN GW parameters/requirements
   3. Issue 2-3: New TS capturing the radio transmission and reception requirements for the NTN-Payload.
3. Topic #3: FR1 Generalities
   1. Issue 3-1: Possible band configuration for S-band

Note: discussion can be separated from coexistence parameters for [98-bis-e][308] NTN\_Solutions\_Part2

* 1. Issue 3-2: [Option not clear]Band definition/combinations for S-band

Note: discussion can be separated from coexistence parameters for [98-bis-e][308] NTN\_Solutions\_Part2

* 1. Issue 3-3: Channel raster for S-band
  2. Issue 3-4: Possible band configuration for L-band

Note: discussion can be separated from coexistence parameters for [98-bis-e][308] NTN\_Solutions\_Part2

* 1. Issue 3-5: Band definition/combinations for L-band

Note: discussion can be separated from coexistence parameters for [98-bis-e][308] NTN\_Solutions\_Part2

* 1. Issue 3-6: Channel raster for L-band
  2. Issue 3-7: De-scope NTN-NTN scenarios in FR1
  3. Issue 3-8: [option not clear] Identify one existing FR1 NR band for satellite deployment for use in coexistence studies

1. Topic #4: FR2 Generalities
   1. Issue 4-1: Consider Ka band for coexistence simulations
   2. Issue 4-2: Consider Ka band as exemplary band
2. Topic #5: HAPS Aspects
   1. Issue 5-1: FR1 NR band for HAPS deployment for use in coexistence studies.
   2. Issue 5-2: NR band n1 as example band for HAPS related coexistence studies.
   3. Issue 5-3: Separate HAPS (NTN-TN and/or NTN-NTN) coexistence scenarios from Satellite (NTN-TN and/or NTN-NTN) coexistence scenarios
3. Topic #6: Updated Work Plan

Note: Work Plan aspects

# Topic #1: NTN Architecture Aspects

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2106899](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106899.zip) | Ericsson | In this contribution, a brief overview of NTN system reference model and reference points was discussed, and a reference model based on handling of “gateway + satellite” as repeater was proposed.    Figure 1 NTN overview architecture and gNB and UE reference points  **Observation1: Test set ups and procedure shall be clearly described in conformance specifications. Keeping GTW+satellite as a separate repeater node would help doing this.**  **Proposal 1: RAN4 should handle gateway + satellite as a repeater and specify needed requirements for gateway + satellite in a new NTN repeater specification.** |
| [R4-2106608](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106608.zip) | ZTE Corporation | **Observation 1: if NTN gateway is cable connected with gNB, then satellite+feeder link+ NTN-gateway would work similar as legacy RRU.**  **Observation 2: if NTN gateway without baseband capability is wireless connected with gNB, then satellite+feeder link+ NTN-gateway would work as simple repeater;**  **Observation 3: if NTN gateway with baseband capability is wireless connected with gNB, then satellite+feeder link+ NTN-gateway would work as relay;**  **Proposal: consider the following diagram to define requirements for NTN network requirements.** |
| [R4-2106545](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106545.zip) | Xiaomi | Option 1  Option 2  Figure 1, two candidate options  **Proposal 1: it is preferred to consider Satellite + feeder link + NTN-Gateway + gNB as a single entity (option 2)**  **Proposal 2: no need to define RF requirements for the linkage between NTN-Gateway and gNB** |
| [R4-2106686](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106686.zip) | Huawei, HiSilicon | Figure 1 User plane Protocol stack (Transparent satellite) - Clause 5.1 TR 38.821    Figure 2 Control plane Protocol stack (Transparent satellite) - Clause 5.1 TR 38.821  It can be found that the Uu interface was not assumed between NTN gateway and gNB.  **Observation 1: Different implementations between NTN-Gateway and gNB can’t be excluded, such as wireless solution, RF cable and optical fiber.**  **Observation 2: Based on the outcome during the Study Phase, Uu interface was not assumed between NTN gateway and gNB.**  **Proposal 1: There is no need to define the RF requirements for the linkage between NTN-Gateway and gNB.**  **Proposal 2: RAN4 can consider (Satellite + feeder link + NTN-Gateway + gNB) as a single entity.** |
| [R4-2104808](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104808.zip) | CATT | In last RAN3 meeting, the following networking-RAN architecture has been included in 38.300 for NTN. It is apparent that Satellite + feeder link + NTN-Gateway + gNB as a single entity is treated as single entity. This entity is seen as a black box without any interface standardized between the components.    Figure 1: Networking-RAN architecture with transparent satellite  **Observation: Satellite + feeder link + NTN-Gateway + gNB is treated as a single entity, which means Option 2 in [1] is correct understanding.**  **Proposal 1: Treat Satellite + feeder link + NTN-Gateway + gNB as a single entity (black box).**  **Observation 2: RF requirement is not possible to be specified between the components within the black box due to lack of standard interface.**  **Proposal 2: It is proposed that no RF requirement is defined for the linkage between NTN-Gateway and gNB. RAN4 should focus on defining RF requirement for service link only.**  **Proposal 3: It is proposed to only specify BS-alike requirements for NTN.** |
| [R4-2107263](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107263.zip) | THALES | **RAN4#98-e Agreements:**   * **RAN4 shall define the corresponding RF requirements for service link between UE and satellite** * **From service link RF requirements aspect, candidate options for the components:**   + **Option 1: Satellite + feeder link + NTN-Gateway as a single entity**   + **Option 2: Satellite + feeder link + NTN-Gateway + gNB as a single entity** * **FFS whether RAN4 shall define RF requirements for the linkage between NTN-Gateway and gNB**   + **Companies are encouraged to further clarify and discuss the assumption of the linkage between NTN-Gateway and gNB**   **Proposal 1:** RAN4 should not consider (Satellite + feeder link + NTN-Gateway) as a NR Relay.  **RAN4#98-e Agreements:**   * In addition, the following agreements regarding overall work were captured in the chairman meeting minutes: * RRM is out of scope based on current WID.   …   * Fixed antenna gain and pattern is assumed   **Proposal 2:** RAN4 should not consider (Satellite + feeder link + NTN-Gateway) as a NR Repeater.  **Proposal 3:** The interface between the NTN-GW and the Non-RF gNB functions is neither radiated nor conducted RF carrier.  Some architecture principles in the draft stage 2 Baseline CR (see R3-211344) have been agreed at RAN3#111-e. In line with these principles, the following figure has been provided to illustrate an example implementation of a Non-Terrestrial Network within an NG-RAN infrastructure for transparent NTN payload:    Figure B-1: NTN based NG-RAN  From the above, the following observations can be made:  **Observation 1:** The NTN-Payload, feeder link and NTN-Gateway forms a single entity called the “NTN Service link provisioning system”.  **Observation 2:** The gNB encompasses both the “NTN Service link provisioning system” and the “non NTN infrastructure gNB functions”.  **Observation 3:** The linkage between the “NTN Service link provisioning system” and the “non NTN infrastructure gNB functions” is not defined by RAN3.  **Proposal 4**: RAN4 to develop new TS capturing the radio transmission and reception requirements for the NTN-Payload.  **Observation 4:** The linkage between NTN-Gateway and modems is expected to be typically implemented with a wired connection (not necessarily RF).  **Proposal 5:** The definition of RF requirements for the linkage between NTN-Gateway and gNB should be optional and therefore can be deprioritised. |

## Open issues summary

*Before e-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:*

**RAN4#98-e Agreements:**

* **RAN4 shall define the corresponding RF requirements for service link between UE and satellite**
* **From service link RF requirements aspect, candidate options for the components:**
  + **Option 1: Satellite + feeder link + NTN-Gateway as a single entity**
  + **Option 2: Satellite + feeder link + NTN-Gateway + gNB as a single entity**

*Open issues and candidate options before e-meeting:*

**Issue 1-1:** Architecture options from RAN4#98e

* Proposals
  + Option 1: **Satellite + feeder link + NTN-Gateway** as a single entity
  + Option 2: **Satellite + feeder link + NTN-Gateway + gNB** as a single entity
* Recommended WF
  + TBA

### Sub-topic 1-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-2:** Potential (architecture type) selection process

* Proposals
  + Option 1: Consider the following diagram to define requirements for NTN



* + Option 2: Other
* Recommended WF
  + TBA

### Sub-topic 1-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-3:** Use architecture as defined by RAN3 as baseline for RAN4

* Proposals
  + Option 1: Use architecture as defined by RAN3 as baseline for RAN4



Figure B-1: NTN based NG-RAN

* + Option 2: Other
* Recommended WF
  + Follow RAN3 architecture agreements as baseline for RAN4

### Sub-topic 1-4

*Sub-topic description*

**RAN4#98-e Agreements:**

* **FFS whether RAN4 shall define RF requirements for the linkage between NTN-Gateway and gNB**
  + **Companies are encouraged to further clarify and discuss the assumption of the linkage between NTN-Gateway and gNB**

*Open issues and candidate options before e-meeting:*

**Issue 1-4:** Type of connexion between NTN-Gateway and Non-NTN Infrastructure gNB functions

* Proposals
  + Option 1: The linkage between NTN-Gateway and Non-NTN Infrastructure gNB functions is expected to be typically implemented with a **wired connection**
  + Option 2: The linkage between NTN-Gateway and Non-NTN Infrastructure gNB functions is expected to be typically implemented with a **non-wired connection**
* Recommended WF
  + TBA

### Sub-topic 1-5

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-5:** <satellite+feeder link+ NTN-gateway> as a RRU, Relay, Repeater

* Proposals
  + Option 1: RAN4 should not consider (Satellite + feeder link + NTN-Gateway) as a NR Repeater.

**Note 1:** no RF requirement is defined for the linkage between NTN-Gateway and gNB

**Note 2:** satellite+feeder link+ NTN-gateway would work similar as legacy RRU.

* + Option 2: RAN4 should consider (Satellite + feeder link + NTN-Gateway) as a NR Repeater.

**Note 1:** need to define the RF requirements for the linkage between NTN-Gateway and gNB.

* Recommended WF
  + The definition of RF requirements for the linkage between NTN-Gateway and gNB should be optional and therefore can be deprioritised.

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #2: Generic Parameters

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2106545](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106545.zip) | Xiaomi | **Proposal 2: no need to define RF requirements for the linkage between NTN-Gateway and gNB** |
| [R4-2106686](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106686.zip) | Huawei, HiSilicon | **Observation 1: Different implementations between NTN-Gateway and gNB can’t be excluded, such as wireless solution, RF cable and optical fiber.**  **Observation 2: Based on the outcome during the Study Phase, Uu interface was not assumed between NTN gateway and gNB.**  **Proposal 1: There is no need to define the RF requirements for the linkage between NTN-Gateway and gNB.** |
| [R4-2104808](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104808.zip) | CATT | **Observation 2: RF requirement is not possible to be specified between the components within the black box due to lack of standard interface.**  **Proposal 2: It is proposed that no RF requirement is defined for the linkage between NTN-Gateway and gNB. RAN4 should focus on defining RF requirement for service link only.**  **Proposal 3: It is proposed to only specify BS-alike requirements for NTN.** |
| [R4-2107263](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107263.zip) | THALES | **Proposal 4**: RAN4 to develop new TS capturing the radio transmission and reception requirements for the NTN-Payload.  **Proposal 6:** RAN4 can consider (when required) current gNB specifications for parameters such as REFSENS.  **Proposal 7:** Specific NTN GW parameters/requirements (e.g. NTN GW REFSENS) are implementation dependent and will be adapted according to existent gNB specification.  **Proposal 8:** If required, RAN4 can reuse in Rel-17 current gNB hypotheses for the ground gNB component in NTN, as described by the technical specification TS 38.104. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 2-1:** gNB hypotheses for the ground gNB component in NTN

* Proposals
  + Option 1: If required, RAN4 can reuse in Rel-17 current gNB hypotheses for the ground gNB component in NTN, as described by the technical specification TS 38.104.
  + Option 2: Other
* Recommended WF
  + TBA

### Sub-topic 2-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 2-2:** NTN GW parameters/requirements

* Proposals
  + Option 1: Specific NTN GW parameters/requirements (e.g. NTN GW REFSENS) are implementation dependent and will be adapted according to existent gNB specification.

**Note 1:** RAN4 can consider (when required) current gNB specifications for parameters such as gNB REFSENS.

**Note 2:** It has been already agreed in RAN3 that NTN GW is not specified by 3GPP in Rel-17.

* + Option 2: Other
* Recommended WF
  + TBA

### Sub-topic 2-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 2-3:** New TS capturing the radio transmission and reception requirements for the NTN-Payload

* Proposals
  + Option 1: New TS capturing the radio transmission and reception requirements for **the NTN-Payload**
  + Option 2: New TS capturing the radio transmission and reception requirements for **Satellite node** **Note:** RAN#91-e agreement, see Proposal NTN-2.2 of RP-210791
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #3: FR1 Generalities

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2107193](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107193.zip) | Nokia, Nokia Shanghai Bell | **Proposal 3: Identify one existing FR1 NR band for satellite deployment for use in coexistence studies.** |
| [R4-2106607](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106607.zip) | ZTE Corporation | First of all, for S-band for NTN, it includes 2 DL bands and 1 UL bands which is much different from the legacy FDD band definition of TN system with only one DL spectrum in companion with only one UL spectrum.   * **Option 1**:to define band X including 2 DL spectrum+ 1 UL spectrum for NTN system; * **Option 2**: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including only DL spectrum; * **Option 3**: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including 1 DL spectrum+ 1 UL spectrum;   **Observation 1:**  Table 1. summary of Pros and Cons of L band definition for NTN system.   |  |  |  | | --- | --- | --- | |  | **Pros** | **Cons** | | **Option 1** | Clear band definition for NTN | UE needs to support the flexible duplex distance which might cause extra implementation complexity compared with other options.  In addition, the impact for other group like RAN1/RAN2 is not clear since this is not aligned with the existing NR frame work. | | **Option 2** | This approach is aligned with the legacy NR CA framework with FDD band+SDL band. | The whole 3 spectrum block could be fully utilized only under the CA framework, this might cause some extra RRC signalling/scheduling overhead compared with Option 1. | | **Option 3** | This approach is aligned with the legacy NR CA framework with two FDD band; | The whole 3 spectrum block could be fully utilized only under the CA framework, this might cause some extra RRC signalling/scheduling overhead compared with Option 1. |   **Proposal 1: propose channel raster as 100kHz for NTN L-band;** |

## Open issues summary

*Before e-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:* The possible band configuration for S-band (can be different from the one used for the coexistence, which might be a subset)

*Open issues and candidate options before e-meeting:*

**Issue 3-1:** Possible band configuration for S-band

* Proposals
  + Option 1: 5, 10, 15, 20, 25, 30 MHz
  + Option 2: 5, 10, 15 MHz
  + Option 3: other
* Recommended WF
  + TBA

### Sub-topic 3-2

*Sub-topic description*

**Note:** The following remark from ZTE is not clear “First of all, for S-band for NTN, it includes 2 DL bands and 1 UL bands which is much different from the legacy FDD band definition of TN system with only one DL spectrum in companion with only one UL spectrum.”

|  |  |
| --- | --- |
| Downlink (space to earth) | 2170 - 2200 MHz & 2483.5 - 2500 MHz |
| Uplink (earth to space) | 1980 - 2010 MHz |

**Moderator note:** The previous S-band contributions were referring to the range 1980 - 2010 MHz (UL) and 2170 - 2200 MHz (DL), so the S-band range that was agreed was one UL and one DL. Please see R4-2015913 (NTN use case scenarios and architectures), R4-2015915 (Possible FR1 exemplary band for NR satellite networks), R4-2101858 (Criteria for Choosing FR1 Exemplary Band), R4-2101859 (NTN FR1 Coexistence Scenarios and Related Core Requirements), and respective WF agreements.

**RAN4#98-e Agreements:**

* **Include S-band, L-band as exemplary bands for FR1** 
  + **Using S-band frequency range i.e. 2GHz for co-existence simulation in FR1**
* **At least one of above bands RF requirements completed, then Rel-17 NTN WI, RF requirements for FR1 can be considered as completed.**

Please also see contribution R4-2107270 (On the S-band NTN coexistence scenarios and simulation parameters):



*Open issues and candidate options before e-meeting:*

**Issue 3-2:** [Option not clear]Band definition/combinations for S-band

* Proposals
  + Option 1: to define band X including 2 DL spectrum+ 1 UL spectrum for NTN system
  + Option 2: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including only DL spectrum
  + Option 3: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including 1 DL spectrum+ 1 UL spectrum;
  + Option 4: 1 DL spectrum+ 1 UL spectrum in the range (1980 - 2010 MHz) and (2170 - 2200 MHz);
  + Option 5: other
* Recommended WF
  + TBA

### Sub-topic 3-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 3-3:** Channel raster for S-band

* Proposals
  + Option 1: 100kHz
  + Option 2: 15kHz
  + Option 3: other
* Recommended WF
  + TBA

### Sub-topic 3-4

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 3-4:** Possible band configuration for L-band

* Proposals
  + Option 1: 5, 10, 15, 20, 25, 30 MHz
  + Option 2: 5, 10, 15 MHz
  + Option 3: other
* Recommended WF
  + TBA

### Sub-topic 3-5

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 3-5:** Band definition/combinations for L-band

* Proposals
  + Option 1: to define band X including 2 DL spectrum+ 1 UL spectrum for NTN system
  + Option 2: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including only DL spectrum
  + Option 3: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including 1 DL spectrum+ 1 UL spectrum;
  + Option 4: other
* Recommended WF
  + TBA

### Sub-topic 3-6

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 3-6:** Channel raster for L-band

* Proposals
  + Option 1: 100kHz
  + Option 2: 15kHz
  + Option 3: Other
* Recommended WF
  + TBA

### Sub-topic 3-7

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 3-7:** De-scope NTN-NTN scenarios

* Proposals
  + Option 1: **De-scope NTN-NTN scenarios for satellite** in Rel-17

**Note 1:** Satellite operators occupy the same or partly overlapping frequency ranges, but different orbital slots or orbital trajectories.

**Note 2:** Satellite (NTN-NTN) operation principles are different from TN-TN.

**Note 3:** There are different co-existence mechanisms between GSO and NGSO, but the overarching principle remains the same.

* + Option 2: **Do not de-scope NTN-NTN scenarios for satellite** in Rel-17
* Recommended WF
  + TBA

### Sub-topic 3-8

*Sub-topic description*

Nokia wrote “Identify one existing FR1 NR band for satellite deployment for use in coexistence studies.”, however comment is not clear. Please see RAN4#98e decisions:

**RAN4#98-e Agreements:**

* **Include S-band, L-band as exemplary bands for FR1** 
  + **Using S-band frequency range i.e. 2GHz for co-existence simulation in FR1**
* **At least one of above bands RF requirements completed, then Rel-17 NTN WI, RF requirements for FR1 can be considered as completed.**
* **NTN UE parameters**
  + **Handheld UEs for FR1.**
* **TN UE parameters**
  + **The existing RF requirements (i.e. ACS and ACLR for both BS and UE) of TN in the spec (i.e. TS 38.104 and 38.101) shall be reused when doing the coexistence study between NTN and TN.**

Question from the moderator: Do you mean this proposal is for existent FR1 NR band different from MSS S-band?



*Open issues and candidate options before e-meeting:*

**Issue 3-8:** [option not clear] Identify one existing FR1 NR band for satellite deployment for use in coexistence studies

* Proposals
  + Option 1: Identify one existing FR1 NR band for satellite deployment for use in coexistence studies

**Note:** Exemplary FR1 NR bands (S-band and L-band) for satellite deployments have been already selected in RAN4#98e. However, only S-band will be used for coexistence studies with TN.

* + Option 2: Other
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #4: FR2 Generalities

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2107217](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107217.zip) | Hughes/EchoStar, Inmarsat, Thales, ESA, Intelsat | RP-210439 provided much useful information with respect to potential simulation parameters, deployment scenarios for **broadband satellite communications**, and coexistence in adjacent bands.  **cid:image012.png@01D71715.911937A0**  However, RAN4 should be also aware that **the estimated current workload for proposed Ka-band coexistence scenarios is at least 5 times lower than current exemplary S-band coexistence scenarios**, for several reasons that will be further addressed in this paper.  **cid:image010.png@01D71744.932A31F0**  **Observation 1:** For S-band there are currently at least **58 scenarios** to be considered for simulations required for coexistence studies in adjacent bands.  **Observation 14:** For Ka-band the best case is with only **6 scenarios** to be considered for coexistence in adjacent bands.  **Observation 15:** For Ka-band the worst case is with only **12 scenarios** to be considered for coexistence in adjacent bands.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Combination | **Aggressor** | **Victim** | Comment | Number of scenarios | | TN with NTN | TN DL | NTN UL | TN in TDD, scenario also considered in FR1 | At least 4 (since no HAPS and no LEO@1200) but can be reduced to 2 (if only GEO) | | TN with NTN | NTN UL | TN DL | TN in TDD, scenario also considered in FR1 | At least 4 (since no HAPS and no LEO@1200) but can be reduced to 2 (if only GEO) | | TN with NTN | NTN UL | TN UL | TN in TDD, scenario not considered in FR1. | At least 4 (since no HAPS and no LEO@1200) but can be reduced to 2 (if only GEO) | | **Total number of scenarios Ka-band** |  | |  | **Best case: 6**  **Worst case: 12** |   **TN-NTN coexistence scenarios in adjacent bands for Ka-band**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Frq.** | **TN** | **TN scenario** | **NTN** | | **1** | 27 GHz-30 GHz | NR | Dense urban | GEO | | **2** | 27 GHz-30 GHz | NR | Dense urban | LEO 600km | | **3** | 27 GHz-30 GHz | NR | Urban macro | GEO | | **4** | 27 GHz-30 GHz | NR | Urban macro | LEO 600km |   **Observation 16:** Currently there are at least 58 types of coexistence scenarios for S-band, while for Ka-band there are only 6 (best case) and 12 (worst case). **Therefore, we estimate the Ka-band required simulations for coexistence scenarios in adjacent bands between 1/10 and 1/5 as compared with S-band.** |
| [R4-2107193](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107193.zip) | Nokia, Nokia Shanghai Bell | **Observation 5: It is not clear if any currently used satellite bands (e.g. Ka band) can be covered by the FR2 range, or not.**  **Observation 6: There are no FDD bands include in the FR2 specification and therefor no requrements for FR2 FDD bands already defined in the specification.**  **Proposal 4: Postpone NTN coexistence studies for a NR FR2 band until requrements for FDD bands in the FR2 range have been included to specification.** |
| [R4-2106897](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106897.zip) | Ericsson | **Observation 1: ITU-R allowed ESIM to use the FSS spectrum only in frequency range 17.7-20.2 GHz (space-to-Earth) and 27.5-30.0 GHz (Earth-to-space).**  **Observation 2: Specific regulatory and technical conditions have been defined to allow ESIM in ITU-R to use those bands, see WRC Resolutions 156, 169 and 173.**  **Observation 3: Only ESIM under certain conditions could use FSS spectrum and only in 17.7-20.2GHz and 27.5-30.0GHz.**  **Proposal 1: The frequency ranges considered for NTN shall only be spectrum allocated by ITU to *Mobile satellite* as primary service. The 17.7-20.2 GHz (space-to-Earth) and 27.5-30.0 GHz (Earth-to-space) frequency ranges which might also be considered for NTN band but as a specific band reserved for ESIM type of application.**  **Observation 4: Discussion on Ka-band as a NTN band under ESIM conditions are deferred until after March 2022.**  **Proposal 2: No NTN band will be specified in FR2 in Rel-17.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 4-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 4-1:** Consider Ka band for coexistence simulations

* Proposals
  + Option 1: **Consider** UL Ka band for NTN-TN coexistence simulations in Rel-17

**Note1:** number of coexistence scenarios is much lower than the ones from S-band (FR1);

**Note2:** please note that at least 5 companies proposed this option;

****

**Note3:** the estimated current workload for proposed Ka-band coexistence scenarios is at least 5 times lower than current exemplary S-band coexistence scenarios.

* + Option 2: **Need further discussion and refinement on** UL Ka band for NTN-TN coexistence simulations in Rel-17
  + Option 3: Postpone discussion on Ka band after Rel-17.
* Recommended WF
  + TBA

### Sub-topic 4-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 4-2:** Consider Ka band as exemplary band

* Proposals
  + Option 1: **Consider Ka band** as NTN exemplary band for **satellite broadband communications** in Rel-17

**Note1:** please note that at least 5 companies proposed this option;

**Note2:** please note that only 2 companies proposed to postpone;

* + Option 2: **Need further discussion to consider Ka band** as NTN exemplary band for **satellite** **broadband communications** in Rel-17
  + Option 3: Postpone discussion on Ka band after Rel-17
* Recommended WF
  + TBA

### Sub-topic 4-3

*Sub-topic description: Allocated spectrum type for NTN*

**Issue 4-3:** The frequency ranges considered for NTN shall only be spectrum allocated by ITU to *Mobile satellite* as primary service. The 17.7-20.2 GHz (space-to-Earth) and 27.5-30.0 GHz (Earth-to-space) frequency ranges which might also be considered for NTN band but as a specific band reserved for ESIM type of application.

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

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #5: HAPS Aspects

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2107193](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107193.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: ITU separates spectrum for satellite and HAPS deployments in separate groups.**  **Observation 2: HAPS are already deployed in the LTE spectrum it should be natural also to support these deployments in NR spectrum.**  **Proposal 1: Identify one existing FR1 NR band for HAPS deployment for use in coexistence studies.**  **Proposal 2: Use NR band n1 as example band for HAPS related coexistence studies.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 5-1:** FR1 NR band for HAPS deployment for use in coexistence studies

* Proposals
  + Option 1: **Identify one existing FR1 NR band for HAPS deployment** for use in coexistence studies.
  + Option 2: Other
* Recommended WF
  + TBA

### Sub-topic 5-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 5-2:** NR band n1 as example band for HAPS related coexistence studies

* Proposals
  + Option 1: NR band n1 **as example band** for HAPS related coexistence studies
  + Option 2: NR band n1 **as exemplary band** for HAPS related coexistence studies

**Note:** “Exemplary” as for “Exemplary” NTN FR1 and FR2.

* + Option 3: Other
* Recommended WF
  + TBA

### Sub-topic 5-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 5-3:** Separate HAPS (NTN-TN and/or NTN-NTN) coexistence scenarios from Satellite (NTN-TN and/or NTN-NTN) coexistence scenarios

* Proposals
  + Option 1: Separate HAPS coexistence scenarios from Satellite coexistence scenarios

**Note:** the two NTN systems may consider different bands, different simulation parameters, and/or different specifications

* + Option 2: Do not separate HAPS coexistence scenarios from Satellite coexistence scenarios
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Updated Work Plan

## Companies’ contributions summary

Please see current work plan reflected in **R4-2104879 (revision of R4-2017661**). Companies are invited to provide their feedback, if any.

## Open issues summary

Current Work Plan for current RAN4 RF and next RAN4 meetings:

**April 2021, RAN4#98-bis-e, e-meeting**

* Further discuss coexistence study scenarios to be considered and related simulations assumptions.
* Agree remaining details on the NTN architecture and NTN components description
* Prepare RAN1 LS reply on Doppler estimation and error

**May 2021, RAN4#99, e-meeting**

* Agree on coexistence study scenarios to be considered and related simulations assumptions.
* Early discussion on the calibration of simulations for coexistence study scenarios.
* Start discussion on demodulation performance.

**August 2021, RAN4#100, Toulouse**

* Calibration of simulations for coexistence study scenarios and Initial discussion on simulation results for coexistence study scenarios.
* Further discussion on the RF core requirements (UE and “BS” requirements) for NTN
* Further discuss on exemplary band(s) specific requirements
* Continue discussion on demodulation performance; align on needed requirements and simulation assumptions.

**November 2021, RAN4#101, TBD**

* Further discussion on simulation results for coexistence study scenarios.
* Further discussion on the RF core requirements (UE and “BS” requirements) for NTN
* Further discuss on exemplary band(s) specific requirements
* Continue discussion on demodulation performance and early simulation results; finalize the list of needed requirements and simulation assumptions.
* Start discussion on RF conformance testing.

**February 2022, RAN4#102, TBD**

* Align on simulation results for coexistence study scenarios.
* Further discuss on the RF core requirements (UE and “BS” requirements) for NTN
* Further discuss on exemplary band(s) specific requirements
* Continue discussion on demodulation performance and align on simulation results.
* Further discuss RF conformance testing.
* Start drafting of CRs.

**April 2022, RAN4#103, TBD**

* Further discussion on the RF core requirements (UE and “BS” requirements) for NTN
* Further discussion on exemplary band(s) specific requirements
* Align on demodulation requirements.
* Further discuss RF conformance testing.
* Further drafting of CRs

**May 2022, RAN4#103-bis, TBD**

* Further discussion on the RF core requirements (UE and “BS” requirements) for NTN
* Further discussion on exemplary band(s) specific requirements
* Align on demodulation requirements.
* Further discuss RF conformance testing.
* Further drafting of CRs

**August 2022, RAN4#104, TBD**

* Agree on the RF core requirements (UE and “BS” requirements) for NTN
* Agree on exemplary band(s) specific requirements
* Finalize demodulation requirements.
* Finalize RF conformance testing.
* Endorse CRs

## Companies views’ collection for 1st round

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree/Agree with Changes** | **Work Plan update recommendation** |
|  |  |  |
|  |  |  |
|  |  |  |

## Summary for 1st round

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents

# Appendix: Companies contribution summary

Contribution summaries are as follows:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2104879](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104879.zip) | THALES | **NR\_NTN\_solutions work plan (RF & RRM)**  An updated work plan for the Rel-17 NR-NTN work item is proposed for RAN4. |
| [R4-2107217](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107217.zip) | Hughes/EchoStar, Inmarsat, Thales, ESA, Intelsat | RP-210439 provided much useful information with respect to potential simulation parameters, deployment scenarios for **broadband satellite communications**, and coexistence in adjacent bands.  **cid:image012.png@01D71715.911937A0**  However, RAN4 should be also aware that **the estimated current workload for proposed Ka-band coexistence scenarios is at least 5 times lower than current exemplary S-band coexistence scenarios**, for several reasons that will be further addressed in this paper.  **cid:image010.png@01D71744.932A31F0**  **Observation 1:** For S-band there are currently at least **58 scenarios** to be considered for simulations required for coexistence studies in adjacent bands.  **Observation 14:** For Ka-band the best case is with only **6 scenarios** to be considered for coexistence in adjacent bands.  **Observation 15:** For Ka-band the worst case is with only **12 scenarios** to be considered for coexistence in adjacent bands.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Combination | **Aggressor** | **Victim** | Comment | Number of scenarios | | TN with NTN | TN DL | NTN UL | TN in TDD, scenario also considered in FR1 | At least 4 (since no HAPS and no LEO@1200) but can be reduced to 2 (if only GEO) | | TN with NTN | NTN UL | TN DL | TN in TDD, scenario also considered in FR1 | At least 4 (since no HAPS and no LEO@1200) but can be reduced to 2 (if only GEO) | | TN with NTN | NTN UL | TN UL | TN in TDD, scenario not considered in FR1. | At least 4 (since no HAPS and no LEO@1200) but can be reduced to 2 (if only GEO) | | **Total number of scenarios Ka-band** |  | |  | **Best case: 6**  **Worst case: 12** |   **TN-NTN coexistence scenarios in adjacent bands for Ka-band**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Frq.** | **TN** | **TN scenario** | **NTN** | | **1** | 27 GHz-30 GHz | NR | Dense urban | GEO | | **2** | 27 GHz-30 GHz | NR | Dense urban | LEO 600km | | **3** | 27 GHz-30 GHz | NR | Urban macro | GEO | | **4** | 27 GHz-30 GHz | NR | Urban macro | LEO 600km |   **Observation 16:** Currently there are at least 58 types of coexistence scenarios for S-band, while for Ka-band there are only 6 (best case) and 12 (worst case). **Therefore, we estimate the Ka-band required simulations for coexistence scenarios in adjacent bands between 1/10 and 1/5 as compared with S-band.** |
| [R4-2107193](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107193.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: ITU separates spectrum for satellite and HAPS deployments in separate groups.**  **Observation 2: HAPS are already deployed in the LTE spectrum it should be natural also to support these deployments in NR spectrum.**  **Proposal 1: Identify one existing FR1 NR band for HAPS deployment for use in coexistence studies.**  **Proposal 2: Use NR band n1 as example band for HAPS related coexistence studies.**  **Proposal 3: Identify one existing FR1 NR band for satellite deployment for use in coexistence studies.**  **Observation 4: The RF requirements for the service link provided by LEO and GEO deployments should be at least same level as those for a terrestrial gNB.**  **Observation 5: It is not clear if any currently used satellite bands (e.g. Ka band) can be covered by the FR2 range, or not.**  **Observation 6: There are no FDD bands include in the FR2 specification and therefor no requrements for FR2 FDD bands already defined in the specification.**  **Proposal 4: Postpone NTN coexistence studies for a NR FR2 band until requrements for FDD bands in the FR2 range have been included to specification.** |
| [R4-2106607](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106607.zip) | ZTE Corporation | * **Option 1**:to define band X including 2 DL spectrum+ 1 UL spectrum for NTN system; * **Option 2**: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including only DL spectrum; * **Option 3**: to define band X including 1 DL spectrum+ 1 UL spectrum and band Y including 1 DL spectrum+ 1 UL spectrum;   **Observation 1:**  Table 1. summary of Pros and Cons of L band definition for NTN system.   |  |  |  | | --- | --- | --- | |  | **Pros** | **Cons** | | **Option 1** | Clear band definition for NTN | UE needs to support the flexible duplex distance which might cause extra implementation complexity compared with other options.  In addition, the impact for other group like RAN1/RAN2 is not clear since this is not aligned with the existing NR frame work. | | **Option 2** | This approach is aligned with the legacy NR CA framework with FDD band+SDL band. | The whole 3 spectrum block could be fully utilized only under the CA framework, this might cause some extra RRC signalling/scheduling overhead compared with Option 1. | | **Option 3** | This approach is aligned with the legacy NR CA framework with two FDD band; | The whole 3 spectrum block could be fully utilized only under the CA framework, this might cause some extra RRC signalling/scheduling overhead compared with Option 1. |   **Proposal 1: propose channel raster as 100kHz for NTN L-band;** |
| [R4-2106899](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106899.zip) | Ericsson | In this contribution, a brief overview of NTN system reference model and reference points was discussed, and a reference model based on handling of “gateway + satellite” as repeater was proposed.    Figure 1 NTN overview architecture and gNB and UE reference points  The approach is simply to treat Gateway + satellite as a repeater which would allow for proper co-existence studies needed for compatibility but also not posing any restriction on any functional/performance split between gateway and satellite. In addition, this approach would eliminate the dependencies between gateway/satellite and gNB or UE.  **Observation1: Test set ups and procedure shall be clearly described in conformance specifications. Keeping GTW+satellite as a separate repeater node would help doing this.**  **Proposal 1: RAN4 should handle gateway + satellite as a repeater and specify needed requirements for gateway + satellite in a new NTN repeater specification.** |
| [R4-2106608](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106608.zip) | ZTE Corporation | **Observation 1: if NTN gateway is cable connected with gNB, then satellite+feeder link+ NTN-gateway would work similar as legacy RRU.**  **Observation 2: if NTN gateway without baseband capability is wireless connected with gNB, then satellite+feeder link+ NTN-gateway would work as simple repeater;**  **Observation 3: if NTN gateway with baseband capability is wireless connected with gNB, then satellite+feeder link+ NTN-gateway would work as relay;**  **Proposal: consider the following diagram to define requirements for NTN network requirements.** |
| [R4-2106545](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106545.zip) | Xiaomi | Option 1  Option 2  Figure 1, two candidate options  Based on the discussion on RF interfaces for NR NTN, we give the following proposals:  **Proposal 1: it is preferred to consider Satellite + feeder link + NTN-Gateway + gNB as a single entity (option 2)**  **Proposal 2: no need to define RF requirements for the linkage between NTN-Gateway and gNB** |
| [R4-2106686](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106686.zip) | Huawei, HiSilicon | Referring to clause 5.1 from TR 38.821, the detailed description about transparent satellite architecture can be found. The corresponding Use plane and Control plane Protocol stack are shown below.    Figure 1 User plane Protocol stack (Transparent satellite)    Figure 2 Control plane Protocol stack (Transparent satellite)  It can be found that the Uu interface was not assumed between NTN gateway and gNB.  Based on the discussion, all the observations and proposals are listed below:  **Observation 1: Different implementations between NTN-Gateway and gNB can’t be excluded, such as wireless solution, RF cable and optical fiber.**  **Observation 2: Based on the outcome during the Study Phase, Uu interface was not assumed between NTN gateway and gNB.**  **Proposal 1: There is no need to define the RF requirements for the linkage between NTN-Gateway and gNB.**  **Proposal 2: RAN4 can consider (Satellite + feeder link + NTN-Gateway + gNB) as a single entity.** |
| [R4-2104808](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104808.zip) | CATT | In last RAN3 meeting, the following networking-RAN architecture has been included in 38.300 for NTN. It is apparent that Satellite + feeder link + NTN-Gateway + gNB as a single entity is treated as single entity. This entity is seen as a black box without any interface standardized between the components.    Figure 1: Networking-RAN architecture with transparent satellite  This contribution further discussed the NTN architecture and its impact on RF requirements. The following observations and proposals are concluded.  **Observation: Satellite + feeder link + NTN-Gateway + gNB is treated as a single entity, which means Option 2 in [1] is correct understanding.**  **Proposal 1: Treat Satellite + feeder link + NTN-Gateway + gNB as a single entity (black box).**  **Observation 2: RF requirement is not possible to be specified between the components within the black box due to lack of standard interface.**  **Proposal 2: It is proposed that no RF requirement is defined for the linkage between NTN-Gateway and gNB. RAN4 should focus on defining RF requirement for service link only.**  **Proposal 3: It is proposed to only specify BS-alike requirements for NTN.** |
| [R4-2107263](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107263.zip) | THALES | **RAN4#98-e Agreements:**   * **RAN4 shall define the corresponding RF requirements for service link between UE and satellite** * **From service link RF requirements aspect, candidate options for the components:**   + **Option 1: Satellite + feeder link + NTN-Gateway as a single entity**   + **Option 2: Satellite + feeder link + NTN-Gateway + gNB as a single entity** * **FFS whether RAN4 shall define RF requirements for the linkage between NTN-Gateway and gNB**   + **Companies are encouraged to further clarify and discuss the assumption of the linkage between NTN-Gateway and gNB**   **Proposal 1:** RAN4 should not consider (Satellite + feeder link + NTN-Gateway) as a NR Relay.  **RAN4#98-e Agreements:**   * In addition, the following agreements regarding overall work were captured in the chairman meeting minutes: * RRM is out of scope based on current WID.   …   * Fixed antenna gain and pattern is assumed   **Proposal 2:** RAN4 should not consider (Satellite + feeder link + NTN-Gateway) as a NR Repeater.  **Proposal 3:** The interface between the NTN-GW and the Non-RF gNB functions is neither radiated nor conducted RF carrier.  Some architecture principles in the draft stage 2 Baseline CR (see R3-211344) have been agreed at RAN3#111-e. In line with these principles, the following figure has been provided to illustrate an example implementation of a Non-Terrestrial Network within an NG-RAN infrastructure for transparent NTN payload:    Figure B-1: NTN based NG-RAN  From the above, the following observations can be made:  **Observation 1:** The NTN-Payload, feeder link and NTN-Gateway forms a single entity called the “NTN Service link provisioning system”.  **Observation 2:** The gNB encompasses both the “NTN Service link provisioning system” and the “non NTN infrastructure gNB functions”.  **Observation 3:** The linkage between the “NTN Service link provisioning system” and the “non NTN infrastructure gNB functions” is not defined by RAN3.  **Proposal 4**: RAN4 to develop new TS capturing the radio transmission and reception requirements for the NTN-Payload.  **Observation 4:** The linkage between NTN-Gateway and modems is expected to be typically implemented with a wired connection (not necessarily RF).  **Proposal 5:** The definition of RF requirements for the linkage between NTN-Gateway and gNB should be optional and therefore can be deprioritised.  **Proposal 6:** RAN4 can consider (when required) current gNB specifications for parameters such as REFSENS.  **Proposal 7:** Specific NTN GW parameters/requirements (e.g. NTN GW REFSENS) are implementation dependent and will be adapted according to existent gNB specification.  **Proposal 8:** If required, RAN4 can reuse in Rel-17 current gNB hypotheses for the ground gNB component in NTN, as described by the technical specification TS 38.104. |
| [R4-2106897](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106897.zip) | Ericsson | **Observation 1: ITU-R allowed ESIM to use the FSS spectrum only in frequency range 17.7-20.2 GHz (space-to-Earth) and 27.5-30.0 GHz (Earth-to-space).**  **Observation 2: Specific regulatory and technical conditions have been defined to allow ESIM in ITU-R to use those bands, see WRC Resolutions 156, 169 and 173.**  **Observation 3: Only ESIM under certain conditions could use FSS spectrum and only in 17.7-20.2GHz and 27.5-30.0GHz.**  **Proposal 1: The frequency ranges considered for NTN shall only be spectrum allocated by ITU to *Mobile satellite* as primary service. The 17.7-20.2 GHz (space-to-Earth) and 27.5-30.0 GHz (Earth-to-space) frequency ranges which might also be considered for NTN band but as a specific band reserved for ESIM type of application.**  **Observation 4: Discussion on Ka-band as a NTN band under ESIM conditions are deferred until after March 2022.**  **Proposal 2: No NTN band will be specified in FR2 in Rel-17.** |