**3GPP TSG-RAN WG4 Meeting #98-e *R4-2102974***

Electronic meeting, January 25th – February 5th, 2021

**Agenda item:** 9.28

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [98e][126] NR\_n67

**Document for:** Information

# Introduction

The new WI to introduce NR band n67 re-farmed LTE band 67 was agreed in last RAN#90e meeting.

This agenda item will handle all contributions related to this WI:

* BS RF requirements discussion.
* UE RF requirements discussion

# Topic #1: BS RF

This topic is aiming to agree on the proposed updates of BS RF specifications when introducing band n67.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102169 | Ericsson | **Proposal: Agree with the changes listed in this contribution.** |
| R4-2102491 | Huawei | **Proposal 1**: Operation band n67 is introduced:  **Proposal 2**: Channel bandwidth is introduced:  **Proposal 3**: Channel raster and NR-ARFCN are introduced:  **Proposal 4**: Synchronization raster entries for n67:  **Proposal 5**: Two antenna port reference sensitivity QPSK PREFSENS: |

## Open issues summary

### Sub-topic 1-1

Sub-topic description: n67 band system parameters.

**Issue 1-1: n67 band system parameters.**

* Proposals:
  + Option 1: Band n67 shall be defined as below (Huawei)
    - Band definition

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | Uplink (UL) *operating band* BS receive / UE transmit  FUL,low – FUL,high | Downlink (DL) *operating band* BS transmit / UE receive  FDL,low – FDL,high | Duplex mode |
| n67 | N/A | ~~758 MHz – 803 MHz~~ 738-758MHz | SDL |

Moderator note: the band definition was incorrectly copied from R4-2102491, this was fixed during the 1st round based on Nokia and Huawei’s comments.

* + - CBW

| NR band / SCS / *BS channel bandwidth* | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | SCS  kHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
|  | 15 | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n67 | 30 |  | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |

* + - Channel arrangement

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | ΔFRaster  (kHz) | Uplink  Range of NREF  (First – <Step size> – Last) | Downlink  Range of NREF  (First – <Step size> – Last) |
| n67 | 100 | - | 147600– <20> – 151600 |

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | SS Block SCS | SS Block pattern1 | Range of GSCN  (First – <Step size> – Last) |
| n67 | 15 kHz | Case A | 1850 – <1> – 1888 |

* + Option 2: Band n67 shall be defined as below (Ericsson)
    - Band definition

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | Uplink (UL) *operating band* BS receive / UE transmit  FUL,low – FUL,high | Downlink (DL) *operating band* BS transmit / UE receive  FDL,low – FDL,high | Duplex mode |
| n67 | N/A | 758 MHz – 803 MHz | SDL |

* + - CBW

| NR band / SCS / *BS channel bandwidth* | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | SCS  kHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
|  | 15 | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n67 | 30 |  | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
|  | 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |

* + - Channel arrangement

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | ΔFRaster  (kHz) | Uplink  range of NREF  (First – <Step size> – Last) | Downlink  range of NREF  (First – <Step size> – Last) |
| n67 | 100 | N/A | 151600 – <20> – 160600 |

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern (NOTE 1) | Range of GSCN  (First – <Step size> – Last) |
| n67 | 15 kHz | Case A | 1901 – <1> – 2002 |

* Recommended WF
  + The difference between the 2 proposals is on the NREF and GSCN values, to be checked.

### Sub-topic 1-2

Sub-topic description: n67 band Tx requirements.

**Issue 1-2: n67 band Tx requirements.**

* Proposals:
  + Option 1: Tx requirements updates when introducing band n67, more details in R4-2102169: (Ericsson)
    - OBUE: n67 shall be added to the list of bands for Wide Area cat B option 1 limits for bands below 1GHz, in clause 6.6.4.2.2
    - Spurious: Band n67 shall be added to the coexistence spurious emissions limits, table 6.6.5.2.3-1.
* Recommended WF
  + Agree with this proposal.

### Sub-topic 1-3

Sub-topic description: n67 band Rx requirements.

**Issue 1-3: n67 band Rx requirements.**

* Proposals:
  + Option 1: No impact on Rx requirements when introducing band n67. (Ericsson)
* Recommended WF
  + Agree with this proposal.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Sub topic 1-1: Band 67 frequency is 738-758MHz. Band definition is not correct for both options despite channel arrangement is correct in option 1.  Sub topic 1-2: Should the last column be updated for Band 67/n67 so requirement does not apply to BS operating in Band n67?  Sub topic 1-3:  Others: |
| Huawei | Subtopic 1.1option 1: @Moderator(Dominique), the band definition that is reflected does not correspond to our submission in R4-2102491. Here is the Band definition that was given by our contribution:   |  |  |  | | --- | --- | --- | | NR operating band | Downlink (DL) *operating band* BS transmit / UE receive  FDL\_low – FDL\_high | Duplex Mode | | n67 | 738 MHz – 758 MHz | SDL |   Hence we ask Nokia to revise option1 with theses values.  Option2: The band definition is incorrect and does not correspond to RP-202279 (the given reference), hence channel arrangement (NR-ARFCN and GSCN) are incorrect  Sub topic 1-2:  For first coloumn of in section 2.3.2 of Ericsson’s contribution, the n28 and n67 do not overlap (they overlap only on 1HZ @758MHz) the coexistence spurious limit might not be needed.  Sub topic 1-3: we agree on it. |
| Moderator | Sorry for the confusion, Nokia and Huawei’s comments are all correct. A note has been added to clarify this and the related comments made during the 1st round. |
| Ericsson | Sub topic 1-1: ok with option 1.  Sub topic 1-2: Agree with Nokia’s comment.  Regarding Huawei’s comment, this exemption might still be relevant as bands are adjacent… LTE band 67 is actually also exempted for band 28. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | *NA* |
|  |
|  |
|  |  |
|  |
|  |

## 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:* Option 1 (with moderator’s fix) is agreeable by everyone.  *Candidate options:*  *Recommendations for 2nd round:* NA |
| **Sub-topic#2** | *Tentative agreements:* Proposal for Tx requirements update is agreeable (with given comments)  *Candidate options:*  *Recommendations for 2nd round:* NA |
| **Sub-topic#3** | *Tentative agreements:* No impact on Rx requirements  *Candidate options:*  *Recommendations for 2nd round:* NA |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on the introduction of band n67 | Ericsson |

### CRs/TPs

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

|  |  |
| --- | --- |
| **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)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: UE RF

This topic is aiming to agree on the proposed updates of UE RF specifications when introducing band n67.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102170 | Ericsson | **Proposal: Agree with the changes listed in this contribution.** |
| R4-2102491 | Huawei | **Proposal 1**: Operation band n67 is introduced:  **Proposal 2**: Channel bandwidth is introduced:  **Proposal 3**: Channel raster and NR-ARFCN are introduced:  **Proposal 4**: Synchronization raster entries for n67:  **Proposal 5**: Two antenna port reference sensitivity QPSK PREFSENS: |

## Open issues summary

### Sub-topic 2-1

Sub-topic description: n67 band system parameters.

**Issue 2-1: n67 band system parameters.**

* Recommended WF
  + Shall be aligned with Issue 1-1.

### Sub-topic 2-2

Sub-topic description: n67 band Tx requirements.

**Issue 2-2: n67 band Tx requirements.**

* Proposals:
  + Option 1: As n67 is SDL band, no Tx requirements update is expected when introducing band n67, more details in R4-2102170: (Ericsson)
* Recommended WF
  + Agree with this proposal.

### Sub-topic 2-3

Sub-topic description: n67 band Rx requirements.

**Issue 2-3: n67 band Rx requirements.**

* Proposals:
  + Option 1: Rx requirements updates when introducing band n67 (Huawei):
    - REFSENS values and RB allocations:

|  | Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 70  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n67 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 |  |  |  |  |  |  |  |  |  | SDL |
| 30 |  | -97.1 | -95.1 | -94.0 |  |  |  |  |  |  |  |  |  |

* + Option 2: Rx requirements updates when introducing band n67 (Ericsson):
    - REFSENS values and RB allocations:

| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 70  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n67 | 15 | -98.5 | -95.5 | -93.5 | -90.8 |  |  |  |  |  |  |  |  |  | SDL |
| 30 |  | -95.6 | -93.6 | -91.0 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |

| Operating band / SCS / Channel bandwidth / Duplex mode | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25 MHz | 30 MHz | 40  MHz | 50  MHz | 60  MHz | 70  MHz | 80  MHz | 90  MHz | 100 MHz | Duplex Mode |
| n67 | 15 | 25 | 251 | 251 | 251 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 | 101 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

* Recommended WF
  + Agree with one of the 2 options.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Sub topic 2-1:  Sub topic 2-2:  Sub topic 2-3: Option 1 (Rx)  Others: |
| Ericsson | Sub topic 2-3: Agree with Option 1 |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | *NA* |
|  |
|  |
|  |  |
|  |
|  |

## 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:* To be aligned with 1-1  *Candidate options:*  *Recommendations for 2nd round:* NA |
| **Sub-topic#2** | *Tentative agreements:* No impact on Tx requirements  *Candidate options:*  *Recommendations for 2nd round:* NA |
| **Sub-topic#3** | *Tentative agreements:* REFSENS proposal in option 1 is agreeable  *Candidate options:*  *Recommendations for 2nd round:* NA |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | NA  (agreements to be captured in WF proposed in 1.4.1) |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **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)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |