**3GPP TSG-RAN WG4 Meeting # 98-e R4-200XXXX**

**Electronic Meeting, 25 Jan – 5 Feb., 2021**

**Agenda item:** 9.25.1, 9.25.4.4

**Source:** Hisashi Onozawa (Nokia)

**Title:** Email discussion summary for [98e][124] NR\_47GHz\_Band

**Document for:** Information

# Introduction

UE RF core requirement for NR band n262 is discussed in this email discussion thread.

* Topic #1: Peak EIRP and EIRP spherical coverage
* Topic #2: Multi-band relaxation
* Topic #3: Other Tx requirements
* Topic #4: REFSENS, EIS spherical coverage and other Rx requirements.

The updated TR is also treated in the last topic.

* Topic #5: Other

# Topic #1: Peak EIRP and EIRP spherical coverage

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100567  Peak EIRP and EIRP spherical coverage for PC3 for n262 | Sony, Ericsson | Observation 1 The spherical coverage performance (delta between peak and 50% EIRP) depends on many factors, and it cannot be concluded that the n262 band must be worse than, e.g., n259 in terms of spherical coverage.  Proposal 1 In light of discussion in RAN4 #97-e we propose min peak EIRP to be 16.5 dBm for PC3: n262  Proposal 2 The spherical coverage requirement for n262 should be no more than 0.5 dB worse than requirement for n259. |
| R4-2100748  EIRP requirements for n262 | Nokia, Nokia Shanghai Bell | Observation 1. Network deployment of n262 is similar to 28/39 GHz and EIRP requirements should match as much as possible.  Proposal 1: Peak EIRP requirement for n262 power class 3 UE is 16.5 dBm.  Proposal 2: EIRP spherical coverage requirement for n262 power class 3 UE is 5.8 dBm.  Proposal 3: Multi-band relaxation values for n262 are the same as n259/n260.  Proposal 5: Min peak EIRP and EIRP spherical coverage requirements for n262 are derived assuming 2 dB degradation from n260 or 4 dB from n257/258/n261. |
| R4-2100913  UE RF requirements for 47 GHz band | Samsung | Proposal 1: It is recommended to define the minimum peak EIRP for n262 to be 15.5 dBm based on further analysis.  Observation 1: Taking into account our effort to derive averaged value for the requirement, it is also reasonable to take new mean values by capturing all proposed numbers by this meeting.  Proposal 2: Candidate numbers for the minimum peak EIRP should be updated with 16.4 dBm (mean over mW) and 16.0 dBm (mean over dBm).  Proposal 3: It is recommended to define the REFSENS for 100 MHz bandwidth and -1 dB SNR to be -79.1 dBm based on further analysis.  Proposal 4: Candidate numbers for the REFSENS should be updated with -79.3 dBm (mean over mW) and -79.8 dBm (mean over dBm) as a compromised solution  Observation 2: For 47 GHz, our EIRP value at 50%-tile point is 9.7 dB down from the peak.  Proposal 5: 50%-tile requirement can be defined with a margin of 3 dB on top of simulation data, which is 12.7 dB down from the peak for our simulation data of 47 GHz.  Observation 3: MBR for n262 should be larger than 0.5 dB for the peak EIRP relaxation parameter, ΔMBP,n, and 0.4 dB for the EIRP spherical coverage relaxation parameter, ΔMBS,n.  Proposal 6: MBR can be considered and decided once its single band requirements are defined. |
| R4-2101831  Discussion on MOP for Band n262 | vivo | Observation 1: The 20th percentile (representing a 80% device passing rate) of the reported minimum peak EIRP values for PC3 UE at 47 GHz is 14.38 dBm.  Observation 2: The agreed option of 16.5 dBm or 16.1 dBm representing a ~50% device passing rate of the reported minimum peak EIRP values for PC3 UE at 47 GHz.  Proposal 1: Given the prior agreement of 16.5 dBm or 16.1 dBm, we propose the Min peak EIRP at 47 GHz to be 16.1 dBm.  Proposal 2: According to the gain drop trend from 28GHz to 47GHz, we propose the EIRP Spherical coverage at 47 GHz to be 2.2 dBm. |
| R4-2102590  Peak EIRP and EIRP Spherical coverage for n262 | Apple Inc. | Proposal 1: The single-band minimum peak EIRP requirement for band n262 is 12.7 dBm.  Proposal 2: RAN4 shall define the UE spherical coverage for power class 3 for n262 as -0.7 dBm.  Observation 1: Degradation of the realized antenna gain when supporting 39 GHz + 47 GHz needs to be considered in the MBR requirement.  Proposal 2: Introduce the multi-band relaxation requirement for n262 as provided in Table 2. |
| R4-2102668  On EIRP spherical coverage requirements for n262 | Qualcomm Incorporated | Observation: An EIRP drop from peak direction to 50th %ile direction in the range of 12.9 dB to 13.9 dB is realistic for PC3 n262 UEs. |
| R4-2102906  EIRP requirements of band n262 | Intel Corporation | PC3 requirements:  Observation 1: Our derived PC3 minimum peak EIRP value for band n262 is 16.4 dBm, which is close to the two options captured in last meeting’s WF.  Proposal 1: From the options captured in RAN4 #97e, define the PC3 single-band minimum peak EIRP requirement of band n262 as 16.1 dBm.  Observation 2: Considering the previously defined PC3 spherical coverage requirements, it is reasonable to use 13.4 dB drop from peak for the spherical coverage requirement of n262 (both EIRP and EIS).  PC1 requirements:  Proposal 2: Define the PC1 minimum peak EIRP requirement of band n262 as 29.5 dBm.  Proposal 3: Use 85th percentile point for *all* PC1 spherical coverage requirements of band n262.  Observation 3: Given the increase in frequency band n262 represents, we should discuss whether we can reuse the 8 dB drop from peak used in other FR2 bands for PC1 spherical coverage, or if the drop needs to be increased. |

## Open issues summary

### Sub-topic 1-1 Peak EIRP analysis (PC3)

The following table summarizes the peak EIRP for PC3 that has been analyzed in RAN4#97e and #98e, as well as the proposed agreement by each company. The mean values are updated including a new result from Samsung, which is 0.1 dB lower than the last meeting.

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| --- | --- | --- | --- | --- |
| **tdoc** | **company** | **min pk EIRP (dBm)**  **Analyzed in RAN4#97e** | **min pk EIRP (dBm)**  **Analyzed in RAN4#98e** | **Proposed EIRP in RAN4#98e** |
| R4-2014263 | Qualcomm | 14.8 |  |  |
| R4-2015855  R4-2100567 | Sony, Ericsson | 18.0  18.0 |  | 16.5 |
| R4-2015888  R4-2102906 | Intel | 17.0 |  | 16.1 |
| R4-2016229  R4-2101831 | vivo | 16.3 |  | 16.1 |
| R4-2016296  R4-2102590 | Apple | 12.7 |  | 12.7 |
| R4-2100913 | Samsung |  | 15.5 | 15.5 |
| R4-2100748 | Nokia |  |  | 16.5 |
| **Mean values for n262** |  | **16.5 (mean over mW)**  **16.1 (mean over dBm)** | **16.4 (mean over mW)**  **16.0 (mean over dBm)** |  |
| n259 |  | 18.7 |  |  |
| n260 |  | 20.6 |  |  |

### Sub-topic 1-2 EIRP spherical coverage (PC3)

The following table summarizes the EIRP spherical coverage requirement proposed in RAN4#98e for PC3.

The values in brackets are calculated by the moderator with *EIRP drop proposal = peak ERIP proposal – EIRP spherical coverage proposal*.

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| --- | --- | --- | --- |
| **tdoc** | **company** | **EIRP drop from the peak (dB)** | **EIRP spherical coverage (dBm)** |
| R4-2102668 | Qualcomm | 12.9 to 13.9 |  |
| R4-2100567 | Sony, Ericsson | gain drop is no more than 0.5 dB worse than requirement for n259.  i.e., 12.9 to 13.4 dB | (3.6 to 3.1) |
| R4-2102906 | Intel | 13.4 | (2.7) |
| R4-2101831 | Vivo | (13.9) | 2.2 |
| R4-2102590 | Apple | (13.4) | -0.7 |
| R4-2100913 | Samsung | 12.7 | (2.8) |
| R4-2100748 | Nokia | 10.9 | 5.6 |
| **Average** |  | **12.9** |  |
| n259 |  | 12.9 | 5.8 |
| n260 |  | 12.6 | 8 |

### Sub-topic 1-3 EIRP for Power class 1/2/4

Proposed n262 values and existing PC requirements for n257/n258/n260/n261 in TS 38.101-2 are summarized in the table.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | n257 | n258 | n259 | n260 | n261 | **Nokia n262**  R4-2100748 | **Intel n262**  R4-2102906 |
| PC1 | min peak | 40 | 40 | - | 38 | 40 | **36** | **29.5** |
| PC1 | spherical | 32 | 32 | - | 30 | 32 | **28** | **21.5** |
| PC2 | min peak | 29 | 29 | - | - | 29 | **25** |  |
| PC2 | spherical | 18 | 18 | - | - | 18 | **14** |  |
| PC4 | min peak | 34 | 34 | - | 31 | 34 | **29** |  |
| PC4 | spherical | 25 | 25 | - | 19 | 25 | **17** |  |

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1: Peak EIRP**

* Proposals
  + Option 1: 16.4 dBm (mean over mW)
  + Option 2: 16.0 dBm (mean over dBm)
  + Option 3: Other values such as 16.5, 16.1, etc.

Please indicate which option should be agreed with your justifications.

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| --- | --- |
| **Company** | **Comments** |
| Huawei | Prefer 16.5dBm, as requirement assuming with single band, the value should not be far from the value for n259. |
| Ericsson | Option 1, averaging is fair approach and option 2 doesn’t make sense. |
| Sony | Option 1:  We think arithmetic mean (average over linear values) is more correct since the estimate of each company is essentially a couple of loss factors (-dB) and then the arithmetic mean will give less variance comparing to the geometric mean (average over logarithm).  In addition, arithmetic mean was used when we derive the n259 requirement. Therefore, it is preferred here to align with previous defined bands. |
| Qualcomm | Option 1 |
| MediaTek | Option3. We are not ready for Option1 or 2, and would like to have more time for evaluation.  (New comment in V08\_mtk2) We’d like to add our evaluation: 15 dBm. |
| Samsung | Option 2 has been the method for the averaging approach to derive FR2 UE RF requirements in RAN4 like n259. |
| vivo | Prefer option 2. Based on the CDF analysis from proposed values, this is about 50% UE passing rate. |
| T-Mobile USA | Option 1 |
| Nokia | Option 1 |
| Apple | For Option 1 and Option 2 the mean value should consider Samsung’s contribution and the correction from Intel for the peak EIRP. We support Option 2. |
| Intel | Value wise, Option 1 and Option 2 are close, so we are ok with either. |

**Issue 1-2: EIRP spherical coverage**

* Proposals
  + Option 1: Less than 12.9 dB drop (such as 10.9 dB) from the peak
  + Option 2: 12.9 dB drop from the peak (average of proposals/ the same as n259)
  + Option 3: 13.4 dB drop from the peak (extrapolation 1)
  + Option 4: 13.9 dB drop from the peak (extrapolation 2)
  + Option 5: Other values

Please indicate which option should be agreed with your justifications. It would be better to agree Issue 1-1 first, or package agreement of both Issue 1-1 and 1-2 would be needed.

If there is any suggestion how to agree both values, please make comments.

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| --- | --- |
| **Company** | **Comments** |
| Huawei | Option 2 or option 3, or value between. |
| Ericsson | Option 2 and 3 would be fine. Link budget is already very tight. |
| Sony | Option 3 or Option 2: Considering the already tight link budget of n262 we think the spherical coverage gain drop for n262 should be at most 0.5 dB worse than for n259.  In proposal 2 in R4-2100567, we refer to **gain drop** when we compare requirement for n262 and n259 (unfortunately not clear when reading our contribution). |
| Qualcomm | We appreciate the UL budget problem and are ok to sign up for option 2 |
| MediaTek | Option5. We prefer to define peak EIRP firstly, and then define drop for spherical EIRP as prior framework. |
| Samsung | Option 2. Option 1 is also fine if it has a number. |
| vivo | Option 3 or Option 4 is preferred |
| T-Mobile USA | Prefer Option 2. Option 1 would also be facceptable. |
| Nokia | Option 1 or Option 2. |
| Apple | In our contribution (R4-2102590) we have shown that the gain-drop difference between n259 and n262 is around 0.7 dB. Therefore, the gain drop can be between 13.4 dB and 13.9 dB. |
| Intel | Option 3 is preferred, but are also ok with Option 2 |

**Issue 1-3: Other power classes**

Is Nokia or Intel approach acceptable to derive PC1/2/4 EIRP requirements?

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| --- | --- |
| **Company** | **Comments** |
| Huawei | We need more input to derive on PC1/2/4 requirements. |
| Ericsson | Intel’s approach is usual EIRP budget evaluation, while Nokia is extrapolating other bands’ delta to n262,using PC3 EIRP. If we go for EIRP budget evaluation by each company, we would end up by averaging all values… Nokia’s approach should not be worse then and is acceptable. |
| Qualcomm | We would like to study feasibility for n262 and discuss in a future meeting |
| MediaTek | Echo Qualcomm, for PC1/2/4, we also would like to further discuss it in future meetings. |
| Samsung | Extrapolating from existing FR2 values is also meaningful. However, it would be better if we can continue the discussion for other power classes to see the feasibility in future meetings. |
| vivo | More data is needed, suggest to discuss other PCs in future meetings. |
| T-Mobile USA | We are fine with PC discussions in future meetings. |
| Nokia | OK to discuss in next meeting. |
| Intel | Our approach is to use EIRP evaluation to derive the requirement. This should be the approach used in future meetings when more companies share their views on the budget, and we can further discuss the requirement. |

### CRs/TPs comments collection

Please check CR draft in Topic #3.

## 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.*

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| --- | --- |
|  | **Status summary** |
| **Issue 1-1: Peak EIRP** | The following agreement is made in GTW session on Jan 28, 2021.  Agreement for PC3 minimum peak EIRP: 16.0dBm is agreed |
| **Issue 1-2: EIRP spherical coverage** | The following agreement is made in GTW session on Jan 28, 2021.  Agreement for EIRP/EIS gain drop from the minimum peak EIRP/REFSENS: 13.1dB is agreed |
| **1.2.3 Sub-topic 1-3 EIRP for Power class 1/2/4** | Companies are encouraged to provide further analysis on PC1/2/4 in RAN4#99-e.  Inclusion of PC5 to WID may be discussed in RAN. |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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| --- | --- |
| **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: Multi-band relaxation

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100094  Multi-band relaxation for band n262 | Murata Manufacturing Co., Ltd. | Observation 1: For n260 and n259, gain degradation is smaller than current multi-band relaxation specifications (MBP,n=0.5dB, MBS,n=0.4dB).  **Proposal 1: MBP,n for n262 is 0.8dB, MBS,n for n262 is 0.5dB.** |
| R4-2100568  Multiband relaxations for PC3 for n262 | Sony, Ericsson | **Proposal 1 Multi-band relaxation for specification (Table 6.2.2.3-4 in TS 38.101-2 ) for n262 shall be MBP,n=0.5dB and MBS,n=0.4dB.** |
| R4-2100748  EIRP requirements for n262 | Nokia, Nokia Shanghai Bell | Proposal 3: Multi-band relaxation values for n262 are the same as n259/n260. |
| R4-2102590  Peak EIRP and EIRP Spherical coverage for n262 | Apple Inc. | **Proposal 2: Introduce the multi-band relaxation requirement for n262 as provided in Table 2.**  Table 2: UE multi-band relaxation factors for power class 3   |  |  |  | | --- | --- | --- | | **Band** | **MBP,n (dB)** | **MBS,n (dB)** | | n257 | 0.73 | 0.73 | | n258 | 0.6 | 0.7 | | n259 | 0.5 | 0.4 | | n260 | 0.51 | 0.41 | | n261 | 0.52,4 | 0.74 | | **n262** | 1.0 | 1.0 | | Note 1: n260 peak and spherical relaxations are 0 dB for UE that exclusively supports n261+n260  Note 2: n261 peak relaxation is 0 dB for UE that exclusively supports n261+n260  Note 3: n257 peak and spherical relaxations are 0 dB for UE that exclusively supports n261+n257  Note 4: n261 peak and spherical relaxations are 0 dB for UE that exclusively supports n261+n257 | | | |

## Open issues summary

### Sub-topic 2-1 Multi-band relaxation values for PC3

The table summarizes the proposed relaxations for n262 PC3 UE..

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| --- | --- | --- |
| **Multi-band relaxation for n262** | | |
| **Company** | **MBP,n (dB)** | **MBS,n (dB)** |
| Murata | 0.8 | 0.5 |
| Apple | 1.0 | 1.0 |
| Sony, Ericsson | 0.5 | 0.4 |
| Nokia | 0.5 | 0.4 |
| **Average** | **0.7** | **0.575** |

## Companies views’ collection for 1st round

### Open issues

**Issue 2-1: Multi-band relaxation values for PC3**

* Proposals
  + Option 1: MBP,n = 0.8 dB, MBS,n = 0.5 dB.
  + Option 2: MBP,n = 1.0 dB, MBS,n = 1.0 dB.
  + Option 3: MBP,n = 0.5 dB, MBS,n = 0.4 dB.
  + Option 4: MBP,n = 0.7 dB, MBS,n = 0.575 dB.
  + Option 5: Other values

Please indicate which option should be agreed with your justifications.

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| **Company** | **Comments** |
| Huawei | These options assumes the multi-band combination is n259/n260+n262. If 28GHz Band is considered, the relaxation is larger. So when we define on this, do we need to have an assumption that: for n262, the MBR is considered supporting multi-band with 39GHz band? |
| Ericsson | Option 3: n262 link budget is already very tight, any relaxation should be avoided as much as possible. |
| Sony | Option 3: Band n262 is quite narrow (2.1%) compared to other bands. Creating a narrow resonant in addition to existing bands can be carried out without changing antenna dimension significantly. Also considering the already tight link budget of n262 we think relaxation should be kept as low as possible. |
| MediaTek | We’d like to echo the design assumption that covers 37-47GHz shall be at least considered as what R4-2102590 did, that is a possible application case. Note that, we actually only evaluated two bands in a frequency band group before. Hence, it is basically reasonable that n262 MBR value is larger than prior MBR per band values. |
| Samsung | We are ok with Option 4. Otherwise, since the MBR value is so much dependent on the antenna design and UE architecture, we also prefer to have further discussions to accommodate all the UE supports multiple FR2 bands in a next meeting. |
| vivo | Support Option 4. |
| T-Mobile USA | Prefer Option 3 due to tight link budget |
| Nokia | Option 3. |
| Apple | Option 2 as shared in our contribution (R4-2102590). Due to the antenna wideband support (from 37 GHz to 48.2 GHz), the antenna gain will be compromised, either the antenna gain will degrade at the low and high edges of the frequency range, or the gain will have to be optimized for a narrower frequency range limiting the overall performance. A larger MBR for n262 needs to be considered to compensate for the antenna gain reduction when supporting wide BW. |
| Intel | Option 4  We are also ok to further discuss if needed |
| Murata | Option 1 or Option 4: We got option 1 result with 37-47GHz simulation (R4-2100094), but it is possible making MBR smaller. |

### CRs/TPs comments collection

*N/A*

## 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.*

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| --- | --- |
|  | **Status summary** |
| **Issue 2-1: Multi-band relaxation values for PC3** | The following agreement is made in GTW session on Jan 28, 2021.  Agreement for MBR: DMBP,n = 0.7 dB, DMBS,n = 0.7 dB. Note that there might be further discussion for UEs only supporting 28+47GHz*.* |

*Suggestion on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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| **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*

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| --- | --- |
| **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 #3: Other Tx requirement

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100749  TP to TR 38.847: UE Tx requirement for n262 | Nokia, Nokia Shanghai Bell | Text proposal on the transmitter requirement |
| R4-2100750  Introduction of n262 UE RF requirements | Nokia, Nokia Shanghai Bell | CR to introduce n262 to 38.101-2. |
| R4-2102667  On EVM requirements for n262 | Qualcomm Incorporated | Proposal: RAN4 to determine PTRS configuration, phase noise TE algorithm and a calibration condition for both waveform types, DFT-s- and CP- OFDM prior to specifying PTRS in UL for the EVM requirement. |

## Open issues summary

### Sub-topic 3-1 PTRS configuration for UL EVM

**Issue 3-1: PTRS configuration**

PTRS is proposed to be studied for UL EVM. It is for further discussion how PTRS is configured.

### Sub-topic 3-2 Transmitter requirement other than peak EIRP/EIRP spherical coverage

**Issue 3-2: Transmitter requirement other than peak EIRP/EIRP spherical coverage**

There is proposed set of transmitter requirements by Nokia TP R4-2100749 such as CA configurations, min power, OFF power and ACLR.

## Companies views’ collection for 1st round

### Open issues

**Issue 3-1: PTRS configuration**

* Proposals
  + Option 1: RAN4 to determine PTRS configuration, phase noise TE algorithm and a calibration condition for both waveform types, DFT-s- and CP- OFDM prior to specifying PTRS in UL for the EVM requirement.
  + Option 2: PTRS is not required and further study on PTRS configuration is not needed.
  + Option 3: Other solutions

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Option 3, further study is needed. PTRS configuration is considered useless for 28GHz/39GHz EVM test from some companies according to the Rel-15 discussion. For 47GHz, the PN model seem almost the same with 39GHz as provided in current TR 38.803. We would like to see more data analyzing on this, for example, what is the phase noise model used for 47GHz? Why 47GHz need this but 28/39GHz does not need this? |
| Ericsson | Option 2: It might be difficult to reach any agreement on phase noise model, calibration, … |
| Qualcomm | Option 2: In our view there is a lot of work involved in studying it properly as we identify in our contribution. Furthermore, in our judgment using PTRS to suppress phase noise impact has limited benefit even at 47 GHz, for UL, based on competitive implementation choices for oscillators. |

**Issue 3-2: Transmitter requirement other than peak EIRP/EIRP spherical coverage**

Please add your comments if TP R4-2100749 should be revised and how. Note that EIRP requirement will be discussed in Topic #1 and multi-band relaxation in #2.

Please focus on other parts in Issue 3-2, i.e., CA configurations, min power, OFF power and ACLR requirements.

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

### CRs/TPs comments collection

CR draft R4-2100750 will discussed in the 2nd round. The contents of the CR are covered in other issues.

## 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.*

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| --- | --- |
|  | **Status summary** |
| **Issue 3-1: PTRS configuration** | Further analysis is needed.  Collect more views in 2nd round. |
| **Issue 3-2: Other Tx requirement** | Continue to discuss in 2nd round |

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2100749  TP to TR 38.847: UE Tx requirement for n262 | Revised |
| R4-2100750  Introduction of n262 UE RF requirements | 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*

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| --- | --- |
| **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 #3: REFSENS and EIS spherical coverage and other Rx requirement

## Companies’ contributions summary

4.1.1 REFSENS and EIS spherical coverage

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100569  REFSENS and EIS spherical coverage for PC3 for n262 | Sony, Ericsson | Observation 1 The spherical coverage performance (delta between peak and 50% EIRP) depends on many factors, and it cannot be concluded that the n262 band must be worse than, e.g., n259 in terms of spherical coverage.  Proposal 1 In light of discussion in RAN4 #97-e we propose REFSENS to be -79.3 dBm for PC3: n262  Proposal 2 The spherical coverage requirement for n262 should be no more than 0.5 dB worse than requirement for n259. |
| R4-2100751  EIS requirements for n262 | Nokia, Nokia Shanghai Bell | ***Proposal 1: REFSENS requirement for n262 power class 3 UE is -79.3 dBm at 100 MHz channel bandwidth.***  ***Proposal 2: EIS spherical coverage requirement for n262 power class 3 UE is based on +10.9 dB from REFSENS.***  ***Proposal 3: Multi-band relaxation values for n262 are the same as n259/n260.***  ***Proposal 5: REFSENS and EIRS spherical coverage requirements for n262 are derived assuming 2 dB degradation from n260 or 4 dB from n257/258/n261.*** |
| R4-2101832  Discussion on REFSENS and EIS spherical coverage for Band n262 | vivo | **Observation 1:** The 80th percentile of the reported REFSENS values for PC3 UE at 47 GHz is -78 dBm.  **Observation 2:** The potential options of -79.3 dBm or -79.9 dBm representing a ~50% device passing rate of the reported REFSENS values for PC3 UE at 47 GHz.  **Proposal 1**: If the final requirement needs be selected from the agreed options, we propose the REFSENS at 47 GHz to be -79.3 dBm.  **Proposal 2**: According to the gain drop trend from 28 GHz to 47 GHz, we propose the EIS Spherical coverage at 47 GHz to be -65.4 dBm. |
| R4-2102591  Peak EIS and EIS Spherical coverage for n262 | Apple Inc. | Proposal 1: The single-band peak EIS requirement for band n262 is -78.98 dBm/50 MHz, -75.98 dBm/100 MHz, -72.98 dBm/200 MHz, -69.98 dBm/400 MHz  Proposal 2: RAN4 shall consider for EIS spherical coverage for power class 3 for band n262 as provided in Table 1. |
| R4-2102907  EIS requirements of band n262 | Intel Corporation | **PC3 requirements:**  **Observation 1:** Our derived PC3 minimum peak EIS value is -80.2 dBm (100MHz), which is close to the two options captured in the WF. Considering the small difference between the options, we are ok to use either one.  **PC1 requirements:**  **Proposal 1:** Define the PC1 minimum peak EIS requirement of band n262 as **-**90.7 dBm (for 50 MHz CBW). |

4.1.2 Other Rx requirement

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100752 TP to TR 38.847: UE Rx requirement for n262 | Nokia, Nokia Shanghai Bell | TP on receiver requirements are provided |

## Open issues summary

### Sub-topic 4-1 REFSENS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **tdoc** | **company** | **REFSENS (dBm)**  **100 MHz, SNR = -1 dB**  **Analyzed in RAN4#97e** | **REFSENS (dBm)**  **100 MHz, SNR = -1 dB**  **Analyzed in RAN4#98e** | **Proposed REFSENS**  **100 MHz, SNR = -1 dB** |
| R4-2014263 | Qualcomm | -81.5 |  |  |
| R4-2015855  R4-2100569 | Sony, Ericsson | -81.5  -81.5 |  | -79.3 |
| R4-2015888  R4-2102907 | Intel | -80.2 |  | either -79.3 or -79.9 is ok |
| R4-2016229  R4-2101832 | Vivo | -78.5 |  | -79.3 |
| R4-2016296  R4-2102591 | Apple | -76.0 |  | -75.98 |
| R4-2100913 | Samsung |  | -79.1 | -79.1 |
| R4-2100751 | Nokia |  |  | -79.3 |
| **Mean n262** |  | **-79.3 (mean over mW)**  **-79.9(mean over dBm)** | **-79.3 (mean over mW)**  **-79.8(mean over dBm)** |  |
| n259 |  | -81.7 |  |  |
| n260 |  | -82.7 |  |  |

### Sub-topic 4-2 EIS spherical coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **tdoc** | **Company** | **EIS drop from REFSENS** | **EIRP spherical coverage** |  |
| R4-2100569 | Sony, Ericsson | gain drop is no more than 0.5 dB worse than requirement for n259.  i.e., 12.9 to 13.4 dB | (-66.4 to -65.9) |  |
| R4-2101832 | vivo | (13.9) | -65.4 |  |
| R4-2102591 | Apple | (13.4) | -62.6 |  |
| R4-2100913 | Samsung | 12.7 | (-66.4) |  |
| R4-2100748 | Nokia | 10.9 | -68.4 |  |
| **Average** |  | **12.8** |  |  |
| n259 |  | 12.9 | -68.9 |  |
| n260 |  | 12.6 | -70.1 |  |

### Sub-topic 4-3 EIS for Power class 1/2/4

Proposed n262 values and existing PC requirements for n257/n258/n260/n261 in TS 38.101-2 are summarized in the table.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **100 MHz, SNR = -1 dB** | | n257 | n258 | n259 | n260 | n261 | **Nokia n262**  **R4-2100751** | **Intel n262**  **R4-2102907** |
| PC1 | min peak | -94.5 | -94.5 | - | -91.5 | -94.5 | **-89.5** | **[-90.7@50](mailto:-90.7@50)MHz**  **([-87.7@100](mailto:-87.7@100)MHz)** |
| PC1 | spherical | -86.5 | -86.5 | - | -83.5 | -86.5 | **-81.5** |  |
| PC2 | min peak | -89.0 | -89.0 | - |  | -89.0 | **-84.5** |  |
| PC2 | spherical | -78.0 | -78.0 | - |  | -78.0 | **-74.0** |  |
| PC4 | min peak | -94.0 | -94.0 | - | -92.0 | -94.0 | **-90.0** |  |
| PC4 | spherical | -85.0 | -85.0 | - | -80.0 | -85.0 | **-78.0** |  |

### Sub-topic 4-4 Other Rx requirements

ACS and in-band blocking requirements are covered in Nokia TP R4-2100752, where n259/n260 requirement are proposed for n262.

## Companies views’ collection for 1st round

### Open issues

**Issue 4-1: REFSENS**

* Proposals
  + Option 1: -79.3 (mean over mW) (100 MHz, SNR=-1dB)
  + Option 2: -79.8 (mean over dBm) (100 MHz, SNR=-1dB)
  + Option 3: Other values

Moderator proposes that the same mean option as the peak EIRP in Issue 1-1 should be applied to REFSENS. If Issue 1-1 is closed, this issue 4-1 is also closed with the same option. Please indicate whether this approach is ok or not.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Option 1 to be consistent. |
| Sony | We think arithmetic mean (average over linear values) is more correct since the estimate of each company is essentially a couple of loss factors and then the arithmetic mean will give less variance comparing to the geometric mean (average over logarithm).  In addition, arithmetic mean was used when we derive the n259 requirement. Therefore, it is preferred here to align with previous defined bands. |
| Qualcomm | Option 1 |
| MediaTek | Option3. We are not ready for Option1 or 2, and would like to have more time for evaluation.  (New comment in V08\_mtk2) We’d like to add our evaluation: - 82 dBm. |
| Samsung | Option 2 has been the method for the averaging approach to derive FR2 UE RF requirements in RAN4 like n259. |
| vivo | Support Option 1 |
| T-Mobile USA | We would prefer Option 2. The Apple data seems to be an outlier. We’d be interested to understand why the sharp difference from other proposals. |
| Nokia | Option 1 if mean over mW is used for min peak EIRP  Option 2 if mean over dBM is used for min peak EIRP |
| Apple | Option 3: Calculate the mean value considering the values proposed in this meeting. |
| Intel | Prefer Option 1.  Strictly looking at the values, both options are close; so, Option 2 is also ok. |

**Issue 4-2: EIS spherical coverage**

* Proposals

Moderator proposes that the EIRP drop from peak EIRP to EIRP spherical coverage in Issue 1-2 is applied for the EIS drop from REFSENS to EIS spherical coverage. Please indicate whether this approach is ok or not.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Ok, with the approach. |
| Sony | Option 3 or Option 2: Same as in Issue 1-2.  In proposal 2 in R4-2100569, we refer to gain drop when we compare requirement for n262 and n259 (unfortunately not clear when reading our contribution). |
| Qualcomm | OK with moderator suggestion |
| MediaTek | OK, it makes sense. |
| Samsung | We also agree with the proposal. |
| vivo | Agree with the proposal from Moderator. |
| T-Mobile USA | OK with this approach. |
| Nokia | Yes. Gain drop should be specified consistenlty for EIRP and EIS like other bands. |
| Apple | Ok with Moderator’s proposal (EIRP drop applies to EIS drop) |
| Intel | Ok with moderator’s proposal |

**Issue 4-3: EIS for Power class 1/2/4**

Is Nokia or Intel approach acceptable to derive PC1/2/4 EIS requirements?

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | We need to see more input to derive on PC1/2/4 requirement. |
| Ericsson | Same comments as for 1-3, Nokia’s approach would be acceptable then. |
| Qualcomm | To be discussed in future meetings |
| MediaTek | More discussion in future meetings is preferred. |
| Samsung | We can continue the discussion in the future. |
| vivo | EIS for other PCs can be treated in the future meetings with more analysis data. |
| T-Mobile USA | We are OK with more discussions in the future. |
| Nokia | OK to discuss in next meeting. |
| Intel | As with **Issue 1-3**, the approach should be to use EIS evaluation to derive the requirement. This can be discussed in future meetings when more companies provide their views on the budget. |

**Issue 4-4: Other Rx requirement**

Please add your comments if TP R4-2100752 should be revised and how.

Please focus on ACS and in-band blocking requirement as EIS requirements are covered in Issue 4.1, 4-2, and 4-3.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | In R4-2100752, REFSENS should reflect the agreement from 4-1. |

### CRs/TPs comments collection

There is a combined CR with Tx change in R4-2100750. Please check 3.3.2.

## 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** |
| **Issue 4-1: REFSENS** | The following agreement is made in GTW session on Jan 28, 2021.  Agreement for PC3 REFSENS: -79.8dBm is agreed |
| **Issue 4-2: EIS spherical coverage** | The following agreement is made in GTW session on Jan 28, 2021.  Agreement for EIRP/EIS gain drop from the minimum peak EIRP/REFSENS: 13.1dB is agreed |
| **Issue 4-3: EIS for Power class 1/2/4** | Companies are encouraged to provide further analysis on PC1/2/4 in RAN4#99-e. |
| **Issue 4-4: Other Rx requirement** | Continue to discuss in 2nd round |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### 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** |
| R4-2100752  TP to TR 38.847: UE Rx requirement for n262 | 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 #5: Others

The updated TR draft is provided by the TR editor. Here, we just collect the editorial comments if any.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102158  TR 38.847 Introduction of NR Band 262 (47GHz band) | Ericsson | Updated TR is provided. |

## Open issues summary

N/A

## Companies views’ collection for 1st round

### Open issues

If there is any comment to the updated TR, please add comments here.

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

### CRs/TPs comments collection

*N/A*

## Summary for 1st round

### Open issues

*N/A*

### 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** |
| R4-2102158 | Agreeable |

## 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”* |