**3GPP TSG-RAN WG4 Meeting # 102-e R4-220xxxx**

**Electronic Meeting, February 21 – March 3, 2022**

**Agenda item:** 11.1

**Source:** Moderator (Intel Corporation)

**Title:** Email discussion summary for [102-e][337] FR2\_enhTestMethods\_Part1

**Document for:** Information

# Introduction

*This document covers discussions of the Enhanced Test Methods in FR2 study item.*

# Topic #1: General status of SI (AI 11.1)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2203706**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203706.zip)  Proposals to conclude the enhanced test methods study item | Apple | Proposal 1: RAN4 should conclude the preliminary MU assessments for UE RF, RRM, and demodulation based on the agreed assumption on the number of UE antenna elements.  Proposal 2: RAN4 should conclude the max achievable SNR for demodulation and for RRM in the beam peak direction.  Proposal 3: RAN4 should conclude the applicability of Objectives 1-5 to FR2-2 based on the above agreements and capture the related agreements in TR38.884. |

## Open issues summary

### Sub-topic 1-1: Remaining work of SI

**Issue 1-1: Proposals to conclude SI**

*Remaining open issues of the SI are related to Objective 7 (testability aspects for the extension to FR2-2).*

*- Extend the applicability of the RF, RRM, and demodulation permitted methods in TR38.810 to FR2-2*

*- Extend the applicability of Objectives 1 through 5 of this SI to FR2-2*

*The following proposals are listed in R4-2203706 for the conclusion of the SI within Rel-17 scope.*

* **Proposal 1:** RAN4 should conclude the preliminary MU assessments for UE RF, RRM, and demodulation based on the agreed assumption on the number of UE antenna elements.
* **Proposal 2:** RAN4 should conclude the max achievable SNR for demodulation and for RRM in the beam peak direction.
* **Proposal 3:** RAN4 should conclude the applicability of Objectives 1-5 to FR2-2 based on the agreements below and capture the related agreements in TR38.884.
  + As a starting point, the same High DL power and low UL power test cases for which NF based solutions (i.e. CFFNF, CFFDNF, and CFFdeltaNF) are applicable in FR2-1, can be considered for NF based solutions applicability in FR2-2. In case relaxations are needed for IFF/DFF methods for a given test case, it is up to RAN5 to confirm applicability of NF based solutions
  + At least, RSRPB based Rx beam peak search, Single link polarization measurement and Fast Spherical Coverage Method can be applied to 52.6-71GHz directly
* Recommended WF
  + Moderator suggests companies share their views on the three proposals to conclude the SI.

## Companies views’ collection for 1st round

### Open issues

Sub-topic 1-1: Proposals to conclude SI

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| **Company** | **Comments** |
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### CRs/TPs comments collection

*Moderator suggests companies to comment directly for the CR below. in 1.3.2 CRs/TPs comment collection*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | Company A |
| Company B |
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## 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** |
| **Sub-topic #1-1:** | **TBA** |

### 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.*

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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

**TBA**

# Topic #2: OTA test methods for UE RF, RRM and demodulation for 52.6~71GHz (AI 11.1.2)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2203636**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203636.zip)  On FR2-2 Antenna Assumptions | Keysight Technologies UK Ltd | Proposal 1: Feedback is requested from chipset vendors/device manufacturers which single-element antenna assumptions should be considered for PC1, PC2, and PC3 in FR2-2.  Proposal 2: Feedback is requested to clarify the worst-case antenna array configuration (MxN) for PC1 and PC2 UEs in FR2-2.  Proposal 3: Feedback is requested to clarify the beam steering assumptions for PC1, PC2, and PC3 UEs in FR2-2. |
| [**R4-2203704**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203704.zip)  TP to TR38.884 on minimum SNR for RRM test cases for band n263 | Apple | TP on minimum SNR for RRM test cases for band n263, considering this tentative agreement from RAN4 #101Bis-e:  Agreement: Min SENS for n263 400 MHz, based on averaging the proposals in the table is [-73.0 dBm] |
| [**R4-2203705**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203705.zip)  TP to TR38.884 on minimum SNR for demodulation test cases for band n263 | Apple | TP on minimum SNR for demodulation test cases for band n263, considering this tentative agreement from RAN4 #101Bis-e:  Agreement: Min SENS for n263 400 MHz, based on averaging the proposals in the table is [-73.0 dBm] |
| [**R4-2204386**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204386.zip)  FR2-2 OTA test methods for UE demodulation | Intel Corporation | Proposal 1: Ask inputs from TE vendors on possible adjustment of TE parameters to increase max achievable DL SNR during the demod test.  Proposal 2: Discuss the following ways how to increase max achievable SNR for demod testing:   1. Decrease ∆thermal value 2. Adjust TE parameters (e.g., power amplifier 1dB compression point, probe antenna gain) 3. Restrict allocation size within CBWs   Proposal 3: Consider 400MHz as a baseline assumption on max applicable CBW and sampling frequency for definition of multi-path fading channel model. |
| [**R4-2204964**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204964.zip)  TP to TR38.884 on applicability extension of test methods for band FR2-2 | vivo | Provides text proposal to TR 38.884 to capture the applicability of some test methods agreed to be extended to FR2-2 |
| [**R4-2204965**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204965.zip)  Discussion on test methods for FR2-2 | vivo | Proposal 1: For single UE antenna element pattern parameters of FR2-2, reusing the assumptions of FR2-1 except for frequency range.  Proposal 2: Unless otherwise stated, test capability extension of permitted test methods confirmed for FR2-2 can apply to n262.  Proposal 3: Extend applicability of Objective 2 and Objective 5 solutions to n262. |
| [**R4-2205007**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205007.zip)  Discussion on FR2-2 OTA test methods | Huawei, HiSilicon | Proposal 1: Single UE antenna element pattern parameters can be reused as Table G.1.1-1 in TR38.810, and half-power beamwidth and gain need to be further confirmed. |
| [**R4-2205915**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205915.zip)  FR2-2 OTA test methods for UE RRM | Intel Corporation | Proposal 1: Informative assessment of testable RRM DL SNR range for FR2-2 should be performed for the first and second scenario of RRM requirements and for both types of RRM requirements.  Proposal 2: Study the gain difference between fine and rough beams for FR2-2. |
| [**R4-2206091**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2206091.zip)  On general aspects and UE testing methodology for FR2-2 | Intel Corporation | Observation 1: Current test methods in TR 38.810 have been extended to FR2-2, but the general testing and calibration aspects have not.  Proposal 1: RAN4 should confirm if the testing and calibration aspects detailed in Clause 5.2.1.3 of TR 38.810 can be extended to FR2-2.  Observation 2: RAN4 should discuss if a radiating aperture of 5cm can be reused for FR2-2 PC3 derivations. Given the increase in path loss, we may also consider lowering the value of D.  Proposal 2: If D = 5cm is reused for FR2-2, a column for 71 GHz will be added to the minimum range length of DFF table in TR 38.810 (Table 5.2.1.2-1).  Table 5.2.1.2-1: Minimum Range Length of DFF System for D = 5cm   |  |  |  |  | | --- | --- | --- | --- | | f [GHz]  QZ [cm] | 24.25 | … | 71 | | **15** | 0.45 | … | 1.23 | | **30** | 0.53 | … | 1.31 | |
| [**R4-2206092**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2206092.zip)  TP for TR 38.884 on NR test methods extension to FR2-2 | Intel Corporation | Text proposal to TR 38.884 on the extension of test methods to FR2-2 covers the following:   1. RF enhanced test methods extensions approved in R4-2203079 2. General testing and calibration aspects 3. Propagation conditions |
| [**R4-2206116**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2206116.zip)  MIMO EVM Measurement for FR2 | Lenovo | In Section 5.2.3.1.1.2 of TR 38.884-120 on “Method 1 MIMO Equalization,” there is the following text:  “The ZF equalizer coefficients are calculated as pseudo inverse of effective channel matrix, in general:  **Observation 1**: *The expression is not the pseudo-inverse of a square matrix*.  Observation 2: Since the MIMO layers cannot be separated if the matrix does not have full rank, *there is no need for the pseudo-inverse*.  Observation 3: The zero-forcing receiver should be defined using the simple rather than using the expression which is not the pseudo-inverse and requires two additional matrix multiplications.  **Proposal 1:** For two-layer uplink MIMO in FR2, define the zero-forcing receiver as the inverse of the effective channel matrix so that  **Proposal 2:** Agree to the text proposal for Section 5.2.3.1.1.2 of TR38.884-130 in the Appendix. |

## Open issues summary

### General aspects

**Issue 2-1a: General testing and calibration**

*Permitted test methods have been agreed to be extended to FR2-2, but while somewhat implied, the general testing and calibration aspects have not been confirmed to be extended as well.*

* Proposal 1: RAN4 should confirm if the testing and calibration aspects detailed in Clause 5.2.1.3 of TR 38.810 can be extended to FR2-2.
* Recommended WF
  + Moderator suggests companies share their views on whether we can confirm the testing and calibration aspects found in Clause 5.2.1.3 of TR 38.810 can be extended to FR2-2.

**Issue 2-1b: Radiating aperture**

*Given the latest core discussion agreement on the antenna array assumption (R4-2202366), RAN4 should address if a radiating aperture of 5cm can be reused for FR2-2 PC3 derivation, or if a different value is needed.*

* Option 1: Yes, 5cm can be reused for D
  + Proposal: If D = 5cm is reused for FR2-2, a column for 71 GHz will be added to the minimum range length of DFF table in TR 38.810 (Table 5.2.1.2-1).
* Option 2: No, a different value is needed
* Recommended WF
  + Moderator recommends companies provide their input on whether 5cm can be reused, or if another value is needed.
  + If 5cm is reused, a column for 71GHz can be added to Table 5.2.1.2-1. If a different value is agreed, then the min. range length of DFF will be calculated based on that value and can be captured in TR 38.884.

### Sub-topic 2-2: UE types

**Issue 2-2a: Single-element antenna assumptions for PC1, PC2 and PC3**

*Table G.1.1-1 in TR 38.810 details the parameters to use in simulations for the radiation pattern of a single-element antenna.*

Table G.1.1-1: Single Antenna Element Radiation Pattern

|  |  |
| --- | --- |
| Antenna element horizontal radiation pattern | , Am =30 d |
| Horizontal half-power beamwidth of single element | 260° |
| Antenna element vertical radiation pattern | , SLAv =30 dB |
| Vertical half-power beamwidth of single array element | [130º] |
| Array element radiation pattern |  |
| Element gain without antenna losses | [ GE,max = 1.5 dBi ] |

* Proposal 1: Feedback is requested from chipset vendors/device manufacturers which single-element antenna assumptions should be considered for PC1, PC2, and PC3 in FR2-2. (Keysight)
* Proposal 2: Single UE antenna element pattern parameters can be reused as Table G.1.1-1 in TR38.810, and half-power beamwidth and gain need to be further confirmed. (Huawei)
* Recommended WF
  + Companies are encouraged to provide their feedback on which single-element antenna assumptions should be considered for PC3, PC1 and PC2.
  + Moderator suggests companies consider Table G.1.1-1 as baseline and share their views on modifications needed. Content of Table G1.1-2 may also be discussed.

Table G.1.1-2: Composite Antenna Array Radiation Pattern

|  |  |
| --- | --- |
| Composite array radiation pattern in dB | the super position vector is given by:    the weighting is given by: |
| Antenna array configuration (Row×Column) | 8 × 2 |
| Horizontal radiating element spacing dh/λ | 0.5 |
| Vertical radiating element spacing dv/λ | 0.5 |

**Issue 2-2b: Worst-case antenna array configuration (MxN) for PC1 and PC2**

*In RAN4 #101Bis-e, the following agreement was captured for PC3 (R4-2203079)*

|  |
| --- |
| **Agreement:** The worst-case antenna assumption for testability and MU assessment of handheld UEs in FR2-2 is [8 x2]. Single UE antenna element pattern parameters, similar to Table 5.2.3.3-1, need to be finalized in RAN4#102-e. |

* Proposal: Feedback is requested to clarify the worst-case antenna array configuration (MxN) for PC1 and PC2 UEs in FR2-2. (Keysight)
* Recommended WF
  + Moderator suggests companies consider the core requirement discussions and share their views on the worst-case antenna array configuration of PC1 and PC2

**Issue 2-2c: Beam steering assumptions**

*For PC3 in FR2-1, TR 38.810 includes the following beam steering assumptions:*

* *Two 8x2 antenna arrays are integrated in the UE for the spherical coverage analyses*
* *The implementation loss for the antenna near the front is 5dB less than that for the antenna near the back*
* *For Beam Steering Assumptions*
  + *In the xz plane, 45° beam steering granularity (from 45° to 135°) has been used*
  + *In the xy plane, 22.5° beam steering granularity (from -90° to 90°) has been used*

*While the assumption for PC1 in FR2-1 are (R5-198203):*

* *Number of Antenna Arrays – PC1 is notionally a single array device.*
* *Beam Steering assumptions are:*
* *In the xz plane, 4° beam steering granularity (from 30° to 150°)*
* *In the xy plane, 4° beam steering granularity (from -60° to 60°)*
* Proposal: Feedback is requested to clarify the beam steering assumptions for PC1, PC2, and PC3 UEs in FR2-2. (Keysight)
* Recommended WF
  + Moderator recommends companies provide feedback on the beam steering characteristics of PC3, PC2, and PC1 in FR2-2

### Sub-topic 2-3: Test methodology for UE RF

**Issue 2-3: MIMO EVM Measurement**

*In R4-2206116, an issue of EVM measurement for two-layer Tx is identified. Basically, using pseudo-inverse matrix in zero-forcing equalization does not allow to separate MIMO layers and hence correctly measure EVM. The following observations and proposals were made:*

* Observation 1: The expression is not the pseudo-inverse of a square matrix.
* Observation 2: Since the MIMO layers cannot be separated if the matrix does not have full rank, there is no need for the pseudo-inverse.
* Observation 3: The zero-forcing receiver should be defined using the simple rather than using the expression which is not the pseudo-inverse and requires two additional matrix multiplications.
* Proposal 1: For two-layer uplink MIMO in FR2, define the zero-forcing receiver as the inverse of the effective channel matrix so that
* Proposal 2: Agree to the text proposal for Section 5.2.3.1.1.2 of TR38.884-130 in the Appendix.
* Recommended WF
  + Companies are encouraged to provide their view on the necessity of EVM measurement methodology update and suggested text proposal for TR38.884.

### Sub-topic 2-4: Test methodology for RRM

**Issue 2-4: Informative assessment of testable RRM DL SNR range**

*Captured in R4-2203079*

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| **Agreement:** Perform an informative assessment of testable RRM DL SNR range for FR2-2 for maximum frequency (~71GHz) using TR38.810 methodology as starting point. |

* Proposal 1: Informative assessment of testable RRM DL SNR range for FR2-2 should be performed for the first and second scenario of RRM requirements and for both types of RRM requirements
* Proposal 2: Study the gain difference between fine and rough beams for FR2-2
* Recommended WF
  + Companies are encouraged to discuss proposed scenarios and types for SNR assessment. Discussion on necessity of revision of gain difference between fine and rough for FR2-2 is needed.

### Sub-topic 2-5: Test methodology for UE demodulation and CSI

**Issue 2-5a: Informative assessment of testable Demodulation DL SNR range**

*Initial parameters to assess max testable DL SNR were agreed previous meeting. Same time, TE parameters require further confirmation. Analysis provided previous and this meeting show that max DL SNR is quite limited under FR2-1 assumptions on TE parameters.*

* Proposal 1: Ask inputs from TE vendors on possible adjustment of TE parameters to increase max achievable DL SNR during the demodulation test.
* Recommended WF
  + Moderator recommends TE vendors provide their feedback

**Issue 2-5b: FR2-2 max achievable DL SNR adjustment**

*Several ways were proposed on how to increase max achievable SNR for demodulation testing*

* Option 1: Decrease ∆thermal value
* Option 2: Adjust TE parameters (e.g., power amplifier 1dB compression point, probe antenna gain)
* Option 3: Restrict allocation size within CBWs
* Recommended WF
  + Companies are encouraged to provide their view on the proposed options

**Issue 2-5c: Path delay grid**

*Captured in R4-2203079*

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| **Agreement:** Path delay grid   * Max applicable channel bandwidth:   + Option 1: 2GHz   + Option 2: Smaller than 2GHz * Sampling frequency:   + Option 1: 2GHz   + Option 2: 800/400MHz |

* Proposal 1: Consider 400MHz as a baseline assumption on max applicable CBW and sampling frequency for definition of multi-path fading channel model.
* Recommended WF
  + Companies are encouraged to provide their view on the proposed option to limit sampling frequency and max applicable channel bandwidth by 400 MHz

### Sub-topic 2-6: Text proposals for TR 38.884

**Issue 2-6a: TP on minimum SNR for RRM test cases for band n263**

* Recommended WF
  + Moderator suggests companies provide any feedback on TP R4-2203704 directly into Section **2.3.2 CRs/TPs** **comments collection**.

**Issue 2-6b: TP on minimum SNR for demodulation test cases for band n263**

* Recommended WF
  + Moderator suggests companies provide any feedback on TP R4-2203705 directly into Section **2.3.2 CRs/TPs** **comments collection**.

**Issue 2-6c: TP on applicability extension of test methods**

*TP R4-2204964 captures the applicability extension of some enhanced test methods to FR2-2.*

* Recommended WF
  + Moderator suggests companies provide any feedback on TP R4-2204964 directly into Section **2.3.2 CRs/TPs** **comments collection**.

**Issue 2-6d: TP on NR test methods extension to FR2-2**

*TP R4-2206092 includes the RF enhanced test methods extensions approved in R4-2203079, general testing and calibration aspects, and propagation conditions content.*

* Recommended WF
  + Moderator suggests companies provide their feedback on TP R4-2206092 directly into Section **2.3.2 CRs/TPs** **comments collection**. Please include any edits on the wording used.
  + Content of TP R4-2204964 (Issue 2-6c) can be merged into R4-2203079

## Companies views’ collection for 1st round

### Open issues

Sub-topic 2-1: General aspects

Issue 2-1a: General testing and calibration

Issue 2-1b: Radiating aperture

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| **Company** | **Comments** |
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Sub-topic 2-2: UE types

Issue 2-2a: Single-element antenna assumptions for PC3, PC1 and PC2

Issue 2-2b: Worst-case antenna array configuration (MxN) for PC1 and PC2

Issue 2-2c: Beam steering assumptions of PC3, PC1 and PC2

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| **Company** | **Comments** |
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Sub-topic 2-3: Test methodology for UE RF

Issue 2-3: MIMO EVM Measurement

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| **Company** | **Comments** |
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Sub-topic 2-4: Test methodology for UE RRM

Issue 2-4: Informative assessment of testable RRM DL SNR range

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| **Company** | **Comments** |
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Sub-topic 2-5: Test methodology for UE demodulation and CSI

Issue 2-5a: Informative assessment of testable Demodulation DL SNR range

Issue 2-5b: FR2-2 max achievable DL SNR adjustment

Issue 2-5c: Path delay grid

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| **Company** | **Comments** |
| Keysight | **Issue 2-5c: Path delay grid**  What is the justification to limit the max CBW to 400MHz since there was no contribution this meeting to limit max CBW to 400 MHz.  Regarding limiting the sampling frequency, Keysight does not recommend to fix Fsample at this stage as the schedule of practical implementations for FR2-2 is still open. Our recommendation is to define the channel models with accurate delay grid and implementation should be left vendor specific. A validation procedure and acceptance criteria for channel model implementation tolerances should be specified later. The proposed Fsample values are potential options, but for example the signal sample rate is likely to be a multiple of 122.88 MHz in practical implementations. So fixing to a specific Fsample at this stage doesn’t seem feasible |
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### CRs/TPs comments collection

*Moderator suggests companies comment directly to the CRs/TPs comment collection for the CRs below.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2203704 | Company A |
| Company B |
|  |
| R4-2203705 | Company A |
| Company B |
|  |
| R4-2204964 | Company A |
| Company B |
|  |
| R4-2206092 | 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.*

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| --- | --- |
|  | **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”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **T-doc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2203636 | On FR2-2 Antenna Assumptions | Keysight Technologies UK Ltd |  |  |
| R4-2203704 | TP to TR38.884 on minimum SNR for RRM test cases for band n263 | Apple |  |  |
| R4-2203705 | TP to TR38.884 on minimum SNR for demodulation test cases for band n263 | Apple |  |  |
| R4-2203706 | Proposals to conclude the enhanced test methods study item | Apple |  |  |
| R4-2204386 | FR2-2 OTA test methods for UE demodulation | Intel Corporation |  |  |
| R4-2204964 | TP to TR38.884 on applicability extension of test methods for band FR2-2 | vivo |  |  |
| R4-2204965 | Discussion on test methods for FR2-2 | vivo |  |  |
| R4-2205007 | Discussion on FR2-2 OTA test methods | Huawei, HiSilicon |  |  |
| R4-2205915 | FR2-2 OTA test methods for UE RRM | Intel Corporation |  |  |
| R4-2206091 | On general aspects and UE testing methodology for FR2-2 | Intel Corporation |  |  |
| R4-2206092 | TP for TR 38.884 on NR test methods extension to FR2-2 | Intel Corporation |  |  |
| R4-2206116 | MIMO EVM Measurement for FR2 | Lenovo |  |  |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **T-doc number** | **Title** | **Source** | **Recommendation** | **Comments** |
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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

# Annex

Contact information

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| --- | --- | --- |
| **Company** | **Name** | **Email address** |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)