**3GPP TSG-RAN WG4 Meeting # 99-e R4-21XXXX**

**Electronic Meeting, 19th – 27th May, 2021**

**Agenda item:** 4.1.9, 4.2.4

**Source:** Moderator (ZTE)

**Title:** Email discussion summary for [99-e][318] Demod\_R15\_Maintenance

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

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

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

# Topic #1: Rel-15 NR demodulation performance

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108889**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108889.zip) | ANRITSU LTD | Moderator’s remarks:  (1) Propose to change the description on how to calculate Noc for FR2:  - The current method is to first calculate a baseline as reference, i.e., n260, 50MHz channel bandwidth, resulting in -155 dBm, and then apply the REFSENS difference between the target and the baseline  - Proposal is to combine the above two steps into one step, as is done for FR1  (2) More minor changes:  - None-rounded value of ∆thermal from 6dB to 5.87dB  - Final Noc value is rounded to 0.1dB instead of 0.5dB. |
| R4-2108890 | ANRITSU LTD | Mirror CR |
| R4-2108891 | ANRITSU LTD | Mirror CR |
| [**R4-2110741**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110741.zip) | Ericsson | Moderator’s remarks:  (1) Proponent re-iterates it is a generic issue (Adjusting AWGN level impacts input baseband SNR but not invalidates conformance tests), not only for Rel-17 FR2, but also for Rel-15, FR1 and FR2.  (2) Propose the same change (Note X) at least from Rel-16 FR2, and discuss further for Rel-15 FR2  (3) Align similar change for FR1 (offset level up to 16dB instead of 15dB) as well from the same release as the FR2 change. |
| [**R4-2111468**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111468.zip) | Intel Corporation | Editorial changes for TS 38.101-4 Rel-15 |
| R4-2111469 | Intel Corporation | Mirror CR |
| R4-2111470 | Intel Corporation | Mirror CR |
| [**R4-2110489**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110489.zip) | Huawei, HiSilicon | 1. Change the TDD slot configuration specifed in table 8.4.2.2-1 from “FR1.120-2” to ”FR2.120-2” 2. Added the description in RMC that the number of consecutive PDSCH symbols is 0 for the firsr slot of every 20ms. 3. Recalculated the tbSize for CQI index 1 in table A.4-1, table A.4-2 and table A.4-3 |
| R4-2110490 | Huawei, HiSilicon | Mirror CR |
| R4-2110491 | Huawei, HiSilicon | Mirror CR |
| [**R4-2110492**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110492.zip) | Huawei, HiSilicon | ***Observation 1: Overhead of UCI is ignored for the calculation of channel bits and total number of REs for FRCs of UCI multiplexing on PUSCH requirements***  ***Proposal 1: Preparer new CRs to create the new FRCs for UCI multiplexing on PUSCH with recalculation of channel bits and total number of REs considering overhead of UCI.***  ***Observation 2: Overhead of PTRS is ignored for the calculation of channel bits and total number of REs for FRCs of FR2 PUSCH requirements with PTRS***  ***Proposal 2: Prepare the new CRs to add the channel bits and number of REs to FRCs for PUSCH requirements with PTRS considering the overhead of PTRS*** |
| [**R4-2109331**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109331.zip) | Apple | Updated the aperiodic report slot offset for RI reporting test in FR2. |
| R4-2109332 | Apple | Mirror CR |
| R4-2109333 | Apple | Mirror CR |
| R4-2109186 | Intel | CR for the TS 38.101-4 with the following changes:   * Add clarifcation note for tests with multiple UE features/capabilities * Update frequency allocation of CSI-RS and ZP-CSI-RS. Update number of binary channel bits for FRC with BWP size not multiple of 4. * Editorial corrections   + Rename “NZP CSI-RS for beam management” to “NZP CSI-RS for beam refinement” to align with naming for PDSCH and CSI requirements   + Add “Frequency occupation configuration” for “NZP CSI-RS for beam refinement” |
| R4-2109187 | Intel | Mirror CR |
| R4-2109188 | Intel | Mirror CR |
| [**R4-2108846**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108846.zip) | Anritsu corporation | Moderator’s remarks:  Propose to define explicitly HARQ feedback timing in DCI format 1\_0 for PDCCH demodulation tests |
| R4-2108847 | Anritsu corporation | Mirror CR |
| R4-2108848 | Anritsu corporation | Mirror CR |
| [**R4-2110202**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110202.zip) | Keysight Technologies UK Ltd | Correcting wrong FRC numbering and SNR values in TS 38.141-1 (Rel-15) |
| [**R4-2110205**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110205.zip) | Keysight Technologies UK Ltd | Correcting PUCCH format 1 demodulation test AWGN level table in TS38.141-2 (Rel-15), and adding FR2 120kHz SCS setting. |
| [**R4-2110206**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110206.zip) | Keysight Technologies UK Ltd | Correcting number of Tx for test in Table 8.3.4.5-1 TS 38.141-1 (Rel-16) |
| [**R4-2110207**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110207.zip) | Keysight Technologies UK Ltd | Correcting PUCCH format 1 demodulation test AWGN level table in TS38.141-2 (Rel-16), and adding FR2 120kHz SCS setting. |
| R4-2110208 | Keysight Technologies UK Ltd | Mirror CR to R4-2110206 |
| R4-2110209 | Keysight Technologies UK Ltd | Mirror CR to R4-2110207 |
| [**R4-2110210**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110210.zip) | Keysight Technologies UK Ltd | Moderator’s remarks:  Summary for all proposed CRs (R4-210202/05/06/07) |
| [**R4-2110596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110596.zip) | Nokia, Nokia Shanghai Bell | Moderator’s remarks:  Proposing to add a note on AWGN power levels. Similar to those in R4-21010741. |
| [**R4-2110630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110630.zip) | Ericsson | Moderator’s remarks:  Correcting subscript of the variable name for PMI test metric. |
| R4-2110631 | Ericsson | Mirror CR |
| R4-2110632 | Ericsson | Mirror CR |

## 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: Whether or not to update Noc derivation for FR2*

*The current method is to first calculate a baseline as reference, i.e., n260, 50MHz channel bandwidth:*

*Noc = REFSENSPC3, n260, 50MHz -10Log10(SCSREFSENS x PRBREFSENS x 12) – SNRREFSENS + ∆thermal*

*resulting in -155 dBm with the parameters defined, and then apply the REFSENS difference between the target and the baseline:*

*Noc(PC\_X, Band\_Y) = -155 dBm/Hz + REFSENSPC\_X, Band\_Y, 50MHz – REFSENSPC3, n260, 50MHz*

*The final equation actually can be rewritten if merging the above two steps into one as following:*

*Noc(PC\_X, Band\_Y) = REFSENSPC3, n260, 50MHz -10Log10(SCSREFSENS x PRBREFSENS x 12) – SNRREFSENS + ∆thermal*

*+ REFSENSPC\_X, Band\_Y, 50MHz – REFSENSPC3, n260, 50MHz*

*= REFSENSPC\_X, Band\_Y, 50MHz - 10Log10(SCSREFSENS x PRBREFSENS x 12) – SNRREFSENS + ∆thermal which is actually the main proposal in R4-2108889.*

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

**Issue 1-1-1: Whether or not to change the description of deriving Noc for FR2 from a two-step method to one-step method similar as in FR1?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

**Issue 1-1-2: Whether or not to change ∆thermal from 6dB to 5.87dB? Note that in Noc derivation for FR1, ∆thermal is set to 16dB for a 0.1dB noise rise.**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

**Issue 1-1-3: Whether or not to round the final Noc value to 0.1dB instead of 0.5dB?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

### Sub-topic 1-2

*Sub-topic description*

*In BS demodulation tests, adjusting AWGN level may impact input baseband SNR more significantly, but it will not invalidate conformance tests since the input baseband SNR is always lower than that TE output SNR. This is a generic issue.*

*The following Note X for FR2 was agreed to Rel-17:*

**Note X: The AWGN power level contains an AWGN offset of 15dB. If needed for test purposes, the AWGN level can be reduced by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level.**

*The discussion is on whether the same note applies to an earlier Release, and for FR1 as well with a different upper limit.*

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

**Issue 1-2-1: Whether or not to introduce Note X for FR2 to Rel-16?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

**Issue 1-2-2: Whether or not to introduce Note X for FR2 to Rel-15?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

**Issue 1-2-3: Whether or not to introduce a note similar to Note X with a different upper limit 16dB for FR1 to the same release as the FR2 change?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

### Sub-topic 1-3

*Sub-topic description*

*The overhead of UCI and PT-RS for channel bits calculation for FRC of PUSCH requirements are not considered.*

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

**Issue 1-3-1: How to consider the overhead of UCI for channel bits calculation for FRC of UCI multiplexed on PUSCH requirements?**

* Proposals
  + Option 1: Ignore it and keep the FRC as it is now in the specification
  + Option 2: Consider the overhead of UCI for channel bits calculation and update the corresponding FRCs
* Recommended WF
  + TBA

**Issue 1-3-2: How to consider the overhead of PT-RS for channel bits calculation for FRC of FR2 PUSCH requirements with PT-RS configured?**

* Proposals
  + Option 1: Ignore it and keep the FRC as it is now in the specification
  + Option 2: Consider the overhead of PT-RS for channel bits calculation and update the corresponding FRCs
* Recommended WF
  + TBA

### Sub-topic 1-4

*Sub-topic description*

*HARQ feedback timing in DCI format 1\_0 for PDCCH demodulation tests is not explicitly defined in the current specs.*

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

**Issue 1-4-1: Should HARQ feedback timing in DCI format 1\_0 for PDCCH demodulation tests be explicitly defined?**

* Proposals
  + Option 1: Yes, and definition as proposed in R4-2108846.
  + Option 2: Not needed, and keep as it is now.
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1

**Issue 1-1-1: Whether or not to change the description of deriving Noc for FR2 from a two-step method to one-step method similar as in FR1?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| Huawei | Support the option 1. Based on our understanding, the FR2 bands specified in TS 38.101-2 are independent of each other, so it will be misleading if Noc calculation for all FR2 bands are based on n260. |
| Qualcomm | Ok with Option 1. |
| Intel | Option 1 is fine |
| Anritsu | We had a request from Qualcomm RAN5 delegate to use the terminology NocPC\_P, Band\_X = REFSENSPC\_P, Band\_X, 50MHz to make the formula general for other power classes. Anritsu supports this change and would like to update the CR accordingly. |

**Issue 1-1-2: Whether or not to change ∆thermal from 6dB to 5.87dB? Note that in Noc derivation for FR1, ∆thermal is set to 16dB for a 0.1dB noise rise.**

* Proposals
  + Option 1: Yes
  + Option 2: No

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| **Company** | **Comments** |
| Huawei | We prefer Option 1 that is consistent with the calculation result as per the formula in the CR. |
| Qualcomm | Ok with Option 1. |
| Intel | Option 1 is fine |

**Issue 1-1-3: Whether or not to round the final Noc value to 0.1dB instead of 0.5dB?**

* Proposals
  + Option 1: Yes
  + Option 2: No

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| **Company** | **Comments** |
| Huawei | Ok with Option 1, based on our calculation, the Noc is -155.47dBm that is closer to -155.5dBm. We are OK to round it to 0.1dB to be more accurate. |
| Qualcomm | Ok with Option 1. |
| Intel | Option 1 is fine |

Sub topic 1-2

**Issue 1-2-1: Whether or not to introduce Note X for FR2 to Rel-16?**

* Proposals
  + Option 1: Yes
  + Option 2: No

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| **Company** | **Comments** |
| Huawei | The issue was raised in Rel-17 n262 WI and agreed to introduce from at least from Release 17, but we are also OK to introduce it from Release 16, i.e. option 1. |
| Ericsson | For the reasons we discussed in our contribution, we support option 1. |
| Nokia, Nokia Shanghai Bell | Option 1 is our proposal; we maintain our support.  Please find detailed justification and in our contribution **[R4-2110596](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110596.zip)**. |

**Issue 1-2-2: Whether or not to introduce Note X for FR2 to Rel-15?**

* Proposals
  + Option 1: Yes
  + Option 2: No

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| **Company** | **Comments** |
| Huawei | Support option 2. It is enough to introduce this for Rel-16 and Rel-17. |
| Ericsson | Since this is a modification to test setup and is backwardly compatible, we think a change to rel-15 is reasonable to enhance consistency (Option 1). We are OK though if other companies prefer no rel-15 change. |
| Nokia, Nokia Shanghai Bell | Option 1 is our proposal; we maintain our support.  Please find detailed justification and in our contribution **[R4-2110596](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110596.zip)**. |

**Issue 1-2-3: Whether or not to introduce a note similar to Note X with a different upper limit 16dB for FR1 to the same release as the FR2 change?**

* Proposals
  + Option 1: Yes
  + Option 2: No

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| --- | --- |
| **Company** | **Comments** |
| Huawei | OK with option 1. |
| Ericsson | For the reasons we discuss in our paper, we support option 1. Regarding the release, we propose it should be introduce in the same release as agreed for the FR2 note. |
| Nokia, Nokia Shanghai Bell | Option 1 is our proposal; we maintain our support.  Please find detailed justification and in our contribution **[R4-2110596](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110596.zip)**.  Having the notes for FR1 read “15dB” will be actively misleading to readers of the spec, even though it will not be technically wrong. |

Sub topic 1-3

**Issue 1-3-1: How to consider the overhead of UCI for channel bits calculation for FRC of UCI multiplexed on PUSCH requirements?**

* Proposals
  + Option 1: Ignore it and keep the FRC as it is now in the specification
  + Option 2: Consider the overhead of UCI for channel bits calculation and update the corresponding FRCs

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| **Company** | **Comments** |
| Huawei | Support Option 2. For UCI multiplexing on PUSCH requirements, the same FRC as PUSCH requirements are used without consideration of UCI overhead, but UCI overhead affects the parameters of "Total number of bits per slot" and Total symbols per slot". From our understanding, the values for these two parameters defined in the current FRC are only applicable for PUSCH and resource reserved for UCI should be excluded.  2021/05/20:  For normal PUSCH requirements, the channel bits is purely for PUSCH data transmission;  For UCI multiplexed on PUSCH, information for transmission include: PUSCH data, CSI part 1 and CSI part 2. Specific physical resource should be allocated for CSI part 1 and CSI part 2 as per UCI configurations in “Table 8.2.3.1-1: Test parameters for testing UCI on PUSCH”, PUSCH data should be rate matched with UCI, i.e. the corresponding channel bits allocated for CSI part 1 and CSI part 2 should be extracted for channel bits for PUSCH data. |
| Ericsson | We can accept Option 2 to make the specification more precise. But how to update the specification should be further discussed. |
| Nokia, Nokia Shanghai Bell | In our understanding, the “channel bits” in this case are supposed to mean the “data bits” plus the “UCI bits”, since those bits “all are transmitted over the channel”.  As such we don’t think that the UCI bits should be subtracted from this number. Hence option 1 is our current preference.  Or did we misunderstand what the contribution containing this proposal means by “data is rate matched with UCI” and “overhead of UCI”? |
| Samsung | In our view, the total number of bits included both UCI and PUSCH data after rate matching, since both of them has been transmitted simultaneously, occupied by different REs  This is the first meeting to raise the FRC issue for UCI on PUSCH, we are open to further discuss whether it is necessary to define new FRC for CSI part1 and CSI part2 separately to differentiate with PUSCH data, as following example, where the total number of bit or symbol for CSI part1 and part2 should be depended on the code rate of PUSCH, Betaoffset for CSI part1/2   |  |  | | --- | --- | | Reference channel | G-FR2-A4-1 | | Subcarrier spacing [kHz] | 60 | | Allocated resource blocks | 66 | | CP-OFDM Symbols per slot (Note 1) | 9 | | Modulation | 16QAM | | Code rate (Note 2) | 658/1024 | | Payload size (bits) | 18432 | | Transport block CRC (bits) | 24 | | Code block CRC size (bits) | 24 | | Number of code blocks - C | 3 | | Code block size including CRC (bits) (Note 2) | 6176 | | ~~Total number of bits per slot~~ | ~~28512~~ | | Total number of bits per slot for PUSCH data |  | | Total number of bits per slot for CSI part 1 and part 2 |  | | ~~Total symbols per slot~~ | ~~7128~~ | | Total symbols per slot for PUSCH data |  | | Total symbols per slot for CSI part 1 and part 2 |  | |

**Issue 1-3-2: How to consider the overhead of PT-RS for channel bits calculation for FRC of FR2 PUSCH requirements with PT-RS configured?**

* Proposals
  + Option 1: Ignore it and keep the FRC as it is now in the specification
  + Option 2: Consider the overhead of PT-RS for channel bits calculation and update the corresponding FRCs
    - For example:

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| --- | --- |
| Reference channel | G-FR2-A4-1 |
| Subcarrier spacing [kHz] | 60 |
| Allocated resource blocks | 66 |
| CP-OFDM Symbols per slot (Note 1) | 9 |
| Modulation | 16QAM |
| Code rate (Note 2) | 658/1024 |
| Payload size (bits) | 18432 |
| Transport block CRC (bits) | 24 |
| Code block CRC size (bits) | 24 |
| Number of code blocks - C | 3 |
| Code block size including CRC (bits) (Note 2) | 6176 |
| ~~Total number of bits per slot~~ | ~~28512~~ |
| Total number of bits per slot with PTRS |  |
| Total number of bits per slot without PTRS |  |
| ~~Total symbols per slot~~ | ~~7128~~ |
| Total symbols per slot with PTRS |  |
| Total symbols per slot without PTRS |  |

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| **Company** | **Comments** |
| Huawei | Support Option 2. We have same views as Issue 1-3-2, the PTRS overhead should be considered for PUSCH requirements with PTRS. We propose to change the parameter "Total number of bits per slot" to "Total number of bits per slot with PTRS" and "Total number of bits per slot without PTRS" for FRCs which are used for both PUSCH requirements with and without PTRS.  Take G-FR2-A4-1 as an example:   |  |  | | --- | --- | | Reference channel | G-FR2-A4-1 | | Subcarrier spacing [kHz] | 60 | | Allocated resource blocks | 66 | | CP-OFDM Symbols per slot (Note 1) | 9 | | Modulation | 16QAM | | Code rate (Note 2) | 658/1024 | | Payload size (bits) | 18432 | | Transport block CRC (bits) | 24 | | Code block CRC size (bits) | 24 | | Number of code blocks - C | 3 | | Code block size including CRC (bits) (Note 2) | 6176 | | ~~Total number of bits per slot~~ | ~~28512~~ | | Total number of bits per slot with PTRS |  | | Total number of bits per slot without PTRS |  | | ~~Total symbols per slot~~ | ~~7128~~ | | Total symbols per slot with PTRS |  | | Total symbols per slot without PTRS |  |   2021/05/20:  @Nokia: this change is for the number of channel bits instead of the TBS, TBS is same as before by considering xOverhead = 0. |
| Ericsson | We agree with Option 2. |
| Nokia, Nokia Shanghai Bell | For “data” over PUSCH it was consciously decided to set xOverhead to 0 [R4-1816347].  We don’t see any immediate reason to change this for UCI over PUSCH.  Option 1 is our current preference. |
| Samsung | We are fine with option 2. Since the PTRS will impact on the total number of bits/symbol for PUSCH data after rate matching. |
| China Telecom | Share the same view with Nokia, to keep the FRC as it is now in the specification  This issue was not overlooked in Rel-15. I can remember that we did discuss this and decided to set xOverhead to 0. |
|  |  |

Sub topic 1-4

**Issue 1-4-1: Should HARQ feedback timing in DCI format 1\_0 for PDCCH demodulation tests be explicitly defined?**

* Proposals
  + Option 1: Yes, and definition as proposed in R4-2108846.
  + Option 2: Not needed, and keep as it is now.

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| **Company** | **Comments** |
| Huawei | Support Option 2.  From our understanding, it is unnecessary to specify the k1 value for PDCCH requirements since this value is defined for timing between PDSCH and PUCCH which is not related with PDCCH requirements. Furthermore, if k1 has been defined for PDCCH requirements, then k0 should be also considered and too many other test setup parameters not affecting performance need to be defined. They can be left to RAN5.  The reason that k1 has been defined for PDSCH requirements is that we should guarantee k1 should be less than the number of HARQ process.  2021/05/20:  We understand this is a test setup test parameter, it can be configured by RAN5. We are wondering what is the real testing problem that push to define this test parameter in RAN4? How about other test setup related parameters? |
| Apple | Support option 1. The missed scheduling grant for PDCCH requirements is based on counting the DTX on HARQ-ACK transmission and hence related to PDSCH scheduling and timing difference between PDSCH and PUCCH. |
| Qualcomm | Ok with Option 1. However, we would prefer to refer to Annex A.1.2 and A.1.3 for K1 values for TDD instead of copying it. |
| Intel | Same comment as Qualcomm |

### 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.*

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| **CR/TP number** | **Comments collection** |
| **[R4-2111468](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111468.zip)**  **Editorial changes to TS 38.101-4 Rel-15** | Qualcomm: It should be a CAT-D CR since these are only editorial corrections. Also, we prefer not to change “CSI-RS Interval” to “CSI-RS periodicity” for aperiodic CSI reporting test cases since “periodicity” may give a wrong impression. |
| Intel: Thank you for comments. We will update the CR category.  As for CSI RS, based on our understanding, CSI-RS interval for aperiodic test refers to same RRC IE field as CRS-RS periodicity for periodic test. Also, CSI-RS interval for all aperiodic tests is set to “Not configured”. Therefore, to reflect that we refer to the same RRC configuration and avoid confusion, we suggest to align wording for periodic and aperiodic tests |
|  |
| **R4-2109186** | Huawei: We agreed that IE *nrofRBs* specified in TS 38.331 should be multiples of 4, but it doesn’t mean the actual frequency occupation of CSI-RS should be multiples of 4. As per TS 38.331, actual CSI-RS bandwidth is equal to BWP if the configured *nrofRBs* larger than BWP size. Meanwhile, the parameter ” frequency occupation” specified in the common test parameters table of PDSCH/CSI requirements indicates the actual CSI bandwidth rather than value for IE “*nrofRB*”. Therefore, it is feasible to set the actual frequency occupation of CSI-RS to BWP size for all the PDSCH and CSI-RS requirements just by configuring *nrofRBs* larger than BWPs. |
| Ericsson: This correction is fine with us. It is also good to add a note like 'CRS-RS occupies 48PRB' to avoid mistakes in the future |
| Apple: We need to further check. |
| Qualcomm: Ok with CSI-RS allocation change. Can you please clarify why slot 83 should have different number of binary channel bits in Table A.3.2.2.5-2? |
| Huawei: At least we understand that test parameters “frequency occupation” is the actual CSI-RS bandwidth instead of IE “nrofRBs” configuration: |
| Intel: Thank you all for comments.  @Huawei: Based on our understanding, taking into account that name of this parameter is aligned with IE CSI-FrequencyOccupation, we assume that in this table we configure nrofRBs. We are also fine to configure this value higher than BWP size to avoid FRC changes, for example or we can define table with CSI-RS frequency size for each CBW/SCS combination (like for CORESET configuration). Comments from companies are welcome for this issue.  @Qualcomm: Slot 83 is S slot with 9 PDSCH symbols and Slot 82 is D slot with 13 PDSCH symbols. Also, for R.PDSCH.5-2.1 TDD, TRSs are transmitted in slots 82, 83 and for other two FRC in this table TRSs are transmitted in Slots 80, 81. |
| **R4-2110202** | [Nokia]: Agree with correction. |
| Company B |
|  |
| **R4-2110205** | [Nokia]: Agree with correction. Seems there was some CR implementation conflict at one point. |
| Keysight:  Thank you Nokia for pointing CR conflict. I also found (R4-2111048 for 38.141-2 (removal of TBD) has correction on the same table 8.3.2.2.4.2-2 AWGN level, but it missed 120kHz SCS separation and wrong correction on 200MHz CBW noise BW number. Assuming no objection on this CR (205), I will work with Huawei (who submit the CR 1048) to merge or remove duplication. |
| Keysight2: with Off-line communication, table 8.3.2.2.4.2-2 will be removed from Huawei CR 1048 (in discussion 302) to solve overlapped correction. this CR should be kept as is |
| **R4-2110206** | [Nokia]: Agree with correction. |
| Company B |
|  |
| **R4-2110207** | [Nokia]: Agree with correction. |
| Company B |
|  |
| **R4-2110630** | Apple: OK with change. |
| Qualcomm: Ok with the change. However, I have a question. What does follow1, follow2 mean? Can you please clarify? |
|  |
| **R4-2109331** | Qualcomm: Looks ok. Can it be merged with Huawei CR R4-2110489 since it impacts the same table? |
| Apple: We are fine to update the table with corrections from HWs CR |
|  |
| R4-2110489 | Ericsson: Regarding the CQI mapping table Table A.4-1, how do you derive TBS value? Both CQI indexes 1 and 2 correspond to MCS 0, so TBS values for both CQI indexes 0 and 1 should be same. |
| Apple: In the FRC tables the update is not necessary as the TBS already correctly indicated no transmission in slot 0 every 40 slots.  Same comment as Ericsson on CSI RMC table updates. |
| Qualcomm: The old values of TBS in CQI mapping tables look ok to us. Can you please elaborate on how the new numbers were derived? |
| Huawei: We calculated the TBS as per the code rate in the CQI Table in TS 38.214. As companies commented, if we use the code rate corresponding to the MCS table, the original TBS is correct. But the “Spectral efficiency” in the CQI mapping tables are same as the CQI Table instead of MCS table in the core specification, it is causing confusion. If we agree to use the code rate in the MCS table for TBS calculation, the spectral efficiency also should be aligned with the value in the MCS table. |
|  | Intel: Comment for CSI RMC, based on our understanding, existing values are correct. For each CQI value we have mapping to certain MCS value and this MCS value is used for TBS calculation based on procedure from 38.214. For CQI 1 the lowest MCS is used, because there is no MCS corresponding to such coding rate and spectral efficiency. Also, at current stage we have only TBS determination procedure based on MCS table and we don’t have TBS determination procedure based on CQI table. Therefore, we think that current calculation and CSI RMC definition is aligned with RAN1 design. |

## 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** | * *Issue 1-1-1: 4 companies commented supporting Option 1 to merge two-step to one-step method, and change the notation of Noc and REFSENS with revised subscripts.* * *Issue 1-1-2: : 3 companies commented supporting Option 1 to change* ∆thermal from 6dB to 5.87dB * *Issue 1-1-3: 3 companies commented supporting Option 1 to round to 0.1dB instead of 0.5dB*   *Tentative agreements:*  *~~Agree~~ Revise CRs R4-2108889 by changing to the notation of Noc and REFSENS with revised subscripts and its mirror CRs R4-2108890 and R4-2108891.*  *Candidate options:*  *Recommendations for 2nd round:*  No more discussion needed in the second round. |
| **Sub-topic #2** | *Tentative agreements:*   * *With the sub-topic treated on GTW session, the following agreements are made:*   Issue 1-2-1: Opton 1 (Rel-16)  Issue 1-2-3: Option 1 (Rel-16)   * *Issue 1-2-2: Further discussion still needed on whether or not to introduce the same change in Rel-15.*   *Candidate options:*  *Recommendations for 2nd round:*   * *Continue discussion Issue1-2-2*   *Companies are encouraged to consider the closing Rel-15 door in this meeting.* |
| **Sub-topic #3** | *Tentative agreements:*   * *Issue 1-3-1: 4 companies commented, where 2 companies for Option 2, one company for Option 1, and 1 company accept that the issue keeps open for further discussion.*   *Moderator’s recommendation: With multiplexing of UCI bits, the performance impact will pend on the change of actual coding rate for PUSCH data bits. There maybe some cases not sensitive to the multiplexing.*  *Further study is required.*   * *Issue 1-3-2: 4 companies commented, with 2 companies for each option.*   *Similar to recommendation in Issue 1-3-1, further study is required.*  *Candidate options:*  *Recommendations for 2nd round:*   * *Continue discussion Issue 1-3-1 and 1-3-2.* |
| **Sub-topic #4** | *Tentative agreements:*   * *Issue 1-4-1: 4 companies commented, where 3 companies for Option 1 to define explicitly HARQ feedback timing (two companies prefer to referring to instead of copying texts), and 1 company for Option 2 (Not needed).*   *Moderator’s recommendation: more discussions needed for aligned understanding on the necessity.*  *Candidate options:*  *Recommendations for 2nd round:*   * *Continue discussion in the second 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)

**Issue 1-2-2: Whether or not to introduce Note X for FR2 to Rel-15?**

* Proposals
  + Option 1: Yes
  + Option 2: No

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia, Nokia Shanghai Bell | In the first round we agreed to  a) Introduce Note X (with 15dB) for FR2 starting from Rel-16.  b) Introduce Note Y (with 16dB) for FR1, i.e., for both conducted and OTA testing, starting from the same release in which FR2 is introduced.  It now remains to decide, if Note X should be introduced from Rel-15.  There was one contributor that was still on the edge about the inclusion from Rel-15, so we would like to propose introduction from Rel-15 with the following slight wording changes to ease any possible remaining concerns. Example for one case in 38.141-2:  **Table 8.2.1.4.2-2: AWGN power level at the BS input**   |  |  |  |  | | --- | --- | --- | --- | | **BS type** | **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** | | BS type 1-O  (Note 4) | 15 | 5 | -86.5 - ΔOTAREFSENS dBm / 4.5 MHz | |  |  | 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz | |  |  | 20 | -80.2 - ΔOTAREFSENS dBm / 19.08 MHz | |  | 30 | 10 | -83.6 - ΔOTAREFSENS dBm / 8.64 MHz | |  |  | 20 | -80.4 - ΔOTAREFSENS dBm / 18.36 MHz | |  |  | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz | |  |  | 100 | -73.1 - ΔOTAREFSENS dBm / 98.28 MHz | | BS type 2-O (Note 5) | 60 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52 MHz | |  |  | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz | |  | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz | |  |  | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz | |  |  | 200 | EISREFSENS\_50M + ΔFR2\_REFSENS + 21 dBm / 190.08 MHz | | NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1.  NOTE 4: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level.  NOTE 5: The AWGN power level contains an AWGN offset of 15dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | | | |
|  |  |

**Issue 1-3-1: How to consider the overhead of UCI for channel bits calculation for FRC of UCI multiplexed on PUSCH requirements?**

* Proposals
  + Option 1: Ignore it and keep the FRC as it is now in the specification
  + Option 2: Consider the overhead of UCI for channel bits calculation and update the corresponding FRCs
* Recommended WF
  + TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia, Nokia Shanghai Bell | We thank Huawei for providing further background on this issue.  We agree that the REs used for PUSCH transmission are reduced by the REs set aside for UCI transmission. The MathWorks webpage has helpful figures on this topic, that quickly illustrate the issue (note that there is no HARQ in our requirements):  [https://ww2.mathworks.cn/help/5g/ug/nr-uci-multiplexing-on-pusch.html]    We can agree to a slight re-wording of option 2:  Option 2a: Consider the REs taken up by CSI part 1 and part 2 in the “bits per slot” and “REs per slot” calculation and update the corresponding FRCs.  However, how to update the corresponding FRCs, remains to be discussed. Since the FRC is (arguably) only defining the payload details of the data part of the PUSCH, we think a note might be sufficient, that the REs in this FRC only describe the data part and exclude the CSI payload. |
|  |  |

**Issue 1-3-2: How to consider the overhead of PT-RS for channel bits calculation for FRC of FR2 PUSCH requirements with PT-RS configured?**

* Proposals
  + Option 1: Ignore it and keep the FRC as it is now in the specification
  + Option 2: Consider the overhead of PT-RS for channel bits calculation and update the corresponding FRCs
* Recommended WF
  + TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia, Nokia Shanghai Bell | We thank Huawei for their explication of “this change is for the number of channel bits instead of the TBS, TBS is same as before by considering xOverhead = 0”.  It is indeed a bit misleading to have a “Total number of bits per slot” and “Total symbols/resource elements per slot”, that do not remove the PT-RS punctured REs.  We can agree to a slight re-wording of option 2:  Option 2a: Consider the overhead of PT-RS for “bits per slot” and “REs per slot” calculation and update the corresponding FRCs. |
| China Telecom | Thanks for the further discussion.  Now we also got the point, and ok with the modified Option 2a by Nokia. |

**Issue 1-4-1: Should HARQ feedback timing in DCI format 1\_0 for PDCCH demodulation tests be explicitly defined?**

* Proposals
  + Option 1: Yes, and definition as proposed in R4-2108846.
  + Option 2: Not needed, and keep as it is now.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Anritsu | Thanks for the comment during the 1st round.  Reply to Huawei: We agree that we cannot define all parameters in the spec. However we identified two issues with the current PDCCH test cases as follows and thus we propose to correct them.  Issue 1: k1 is not defined only in the PDCCH test case. Issue 2: If we look at PDCCH test case definition, it is containing parameters which are based on DCI format 1-0 (TS38.213 compliant) and 1-1 (TS38.508-1 compliant) mixed together. Thus it is preferrable that k1 value is clarified from the core spec.  Reply to Qualcomm and Intel: We agree to change the way to specify k1 to refer to A.1.2 and A.1.3. |
|  |  |

# Topic #2: Rel-15 LTE demodulation performance

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108807**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108807.zip) | Ericsson | Corrections for TS 36.101, Rel-14: (1) add missing test points for 5CCs; (2) remove [] for CQI reporting requirements. |
| R4-2108808 | Ericsson | Mirror CR to Rel-15 |
| R4-2108809 | Ericsson | Mirror CR to Rel-16 |
| R4-2108810 | Ericsson | Mirror CR to Rel-17 |
| [**R4-2110493**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110493.zip) | Huawei, HiSilicon | Remove square brackets in the specification (Rel-12). |
| [**R4-2110494**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110494.zip) | Huawei, HiSilicon | Remove square brackets in the specification (Rel-13). |
| [**R4-2110495**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110495.zip) | Huawei, HiSilicon | - Removed the remaining square brackets in the specifications (Rel-14)  - Deleted the tests with TBD requirements  - Changed the title of clause 14.9 from “PSCCH/PSSCH decoding capability test ” to “PSCCH decoding capability test”  - Changed the sentence ”The purpose of this test is to verify the maximum number of Sidelink processes supported by the V2X UE.” to “The purpose of this test is to verify the maximum number of received PSCCHs per subframe supported by the V2X UE. ” |
| R4-2110496 | Huawei, HiSilicon | Mirror R4-2110495 to Rel-15 |
| R4-2110497 | Huawei, HiSilicon | Mirror R4-2110495 to Rel-16 |
| R4-2110579 | Huawei, HiSilicon | Mirror R4-2110495 to 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.*

No technical discussion point, mainly for editorial changes or cleanup on the existing specs.

## Companies views’ collection for 1st round

### Open issues

### 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** |
| [**R4-2108807**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108807.zip) | Company A |
| Company B |
|  |
| [**R4-2110493**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110493.zip) | Company A |
| Company B |
|  |
| [**R4-2110494**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110493.zip) | Ericsson: It looks Rel-13 spec did not implement the requirements. If we look Rel-14 spec, Test 2 and Test 3 in Table 8.11.2.2.2-1 set SNR=-12.3dB and SNR=-12.8dB, respectively.  Moevover requirements in Tests 2 and 3 in Table 8.11.2.2.1-1 is wrong; they should be -5.3dB and -8.8dB.  We suggest to revise this CR to follow Rel-14 |
| Huawei: It is fine for us to revise it by following Rel-14 specification if we confirm the same test cases are defined for both Rel-13 and Rel-14.  For Test 3 in Table 8.11.2.2.1-1, it should be -6.8dB instead of -8.8dB as per Rel-14 specification.  The revised CR is uploaded for review. |
|  |
| [**R4-2110495**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110493.zip) | 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:*  *Continue discussion on revising R4-2110494.* |

### 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”.*

*Continue discussion on revising R4-2110494*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
| *Wayforward on AWGN power level* | *Ericsson* |  |
| *Wayforward on overhead consideration for multiplexing of UCI or PTRS on PUSCH* | *Huawei* |  |
| *Wayforward on HARQ feedback for PDCCH demodulation tests* | *Anritsu* |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| [R4-2108889](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108889.zip) |  | ANRITSU LTD | Revised | All three changes in the CR are discussed and agreed. In addition, a more generic subscript is suggested for Noc and REFSENS. Please hold on mirror CRs: R4-2108890 Mirror CR to Rel-16  R4-2108891 Mirror CR to Rel-17 |
| R4-2110741 |  | Ericsson | Noted | One discussion point is left for the second round: Whether or not the same note is introduced in Rel-15. |
| R4-2110596 |  | Nokia | Noted |  |
| R4-2110492 |  | Huawei | Noted |  |
|  |  |  |  |  |
| R4-2108807 |  | Ericsson | Agreeable | No comments received in the first round. Please upload the mirror CRs: R4-2108808 (Mirror to Rel-15)  R4-2108809 (Mirror to Rel-16)  R4-2108810 (Mirror to Rel-17) |
| R4-2110493 |  | Huawei | Agreeable | No comments received in the first round |
| R4-2110494 |  | Huawei | Revised | *Missing and wrong requirements found in Rel-13. Suggested to revise by following Rel-14 specs.* |
| R4-2110495 |  | Huawei | Agreeable | No comments received in the first round. Please upload Mirror CRs: R4-2110496 Mirror CR to Rel-15  R4-2110497 Mirror CR to Rel-16  R4-2110579 Mirror CR to Rel-17 |
| R4-2110210 |  | Keysight | Noted |  |
| R4-2111468 |  | Intel | Revised | 1) Correct on Cat.--> should be Cat. D  2) Keep the term “CSI-RS Interval” in order to avoid wrong impression.  3) Hold on mirror CRs until the revision is agreed: R4-2111469/70 |
| R4-2109186 |  | Intel | Revised | Hold on mirror CRs R4-2109187/88 |
| R4-2110202 |  | Keysight | Agreeable |  |
| R4-2110205 |  | Keysight | Revised |  |
| R4-2110206 |  | Keysight | Agreeable | Please also upload mirror CR R4-2110208 |
| R4-2110207 |  | Keysight | Agreeable | Please also upload mirror CR R4-2110209 |
| R4-2110630 |  | Ericsson | Agreeable | Please also upload mirror CRs R4-2110631/32 |
| R4-2109331 |  | Apple | Agreeable, but merged into R4-2110489 | Its mirror CRs R4-21-9332/9333 are withdrawn since there are already Mirror CRs applied for R4-2110489 |
| R4-2110489 |  | Huawei | Revised | Hold on mirror CRs R4-2110490/91 |
| R4-2108846/47/48 |  | *Anritsu* | Return-to |  |

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