**3GPP TSG-RAN WG4 Meeting #95-e R4-200xxxx**

**Electronic Meeting, May 25th – June 5th 2020**

**Agenda item:** 4.11, 5.14.3, 12.4, 6.21.4

**Source:** Moderator (Intel Corporation)

**Title:** Email discussion summary for [95e][312] Demod\_Maintenance

**Document for:** Information

# Introduction

The scope of this email thread is:

* Rel-15 NR maintenance (AI 4.11)
* Rel-16 LTE maintenance (AI 5.14.3)
* LTE maintenance up to Rel-15 (AI 12.4)
* Note: There are no tdocs submitted in this meeting for Rel-16 NR maintenance (AI 6.21.4)

Email discussion targets for the 1st round and 2nd round

* 1st round:
  + Discuss proposals related to corrections/clarifications of Rel-15 NR requirements
  + Collect comments for NR and LTE CRs.
* 2nd round:
  + Collect comments for revised NR and LTE CRs from the 1st round.
  + Collect comments for WFs (if needed)

# Topic #1: Rel-15 NR maintenance - UE demodulation and CSI requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2006688 | LG Electronics Inc. | Rel-15 CR with the following changes for TS 38.101-4:   * Unnecessary sentence has been removed under clause 4.5.4. |
| R4-2006069 | ANRITSU LTD | Rel-15 CR with the following changes for TS 38.101-4:   * Aperiodic Report Slot Offset is changed from 7 to 6 |
| R4-2006070 | ANRITSU LTD | Rel-16 Cat A CR of R4-2006069 |
| R4-2006134 | Qualcomm Incorporated | Rel-15 CR with the following changes for TS 38.101-4:   * Clarification notes were added to Tables C.3.1-1 and C.5.1-1 |
| R4-2006523 | Intel Corporation | **Proposal 1:** Clarify that EPRE ratio in Tables C.3.1-1 and C.5.1-1 are defined as per port and before precoder.  **Proposal 2:** Change configuration for EPRE ratio of CSI-RS to SSS from 0 to -10\*log10(CDM size) and keep configuration for other parameters unchanged. |
| R4-2006524 | Intel Corporation | Rel-15 CR with the following changes for TS 38.101-4:   * Added references to beamforming model in section B.4.1 for FR1 and FR2 PDSCH and PDCCH requirements * Updated precoder configuration for FR2 PDSCH and PDCCH requirements to align with FR1 wording * Added reference on TS 38.214 in section with beamforming model * Added details of PDCCH, PBCH, SSS, PSS mapping to physical antenna elements |
| R4-2006525 | Intel Corporation | Rel-16 Cat A CR of R4-2006524 |
| R4-2006541 | Intel Corporation | Rel-15 CR with the following changes for TS 38.101-4:   * Added 2x4 MIMO correlation matrix * Added 4x4 MIMO correlation matrix |
| R4-2006542 | Intel Corporation | Rel-16 Cat A CR of R4-2006541 |
| R4-2006959 | Rohde & Schwarz | Rel-15 CR with the following changes for TS 38.101-4:   * Clarified PBCH mapping to a single antenna in Annex B. * Added PDCCH precoding to non-PDCCH tests where missing. * Updated PDCC precoding for SDR and CSI requirements. * Clarified Precoding for PDCCH DMRS and PDSCH DMRS * Added notes in tables. * Updated Annex C. |
| R4-2007226 | Huawei, HiSilicon | Rel-15 CR with the following changes for TS 38.101-4:   * Added the following clarification for some CQI tests: *To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB* |
| R4-2007227 | Huawei, HiSilicon | **Observation 1:** The SNR definition in TS 38.101-4 to be applied on the receiver antenna connectors is the energy before precoding.  **Observation 2:** The SSS EPRE can be derived from ss-PBCH-BlockPower provided by higher layer.  **Observation 3:** The PDSCH EPRE and NZP CSI-RS EPRE in powerControlOffset and powerControlOffsetSS are the energy of all ports multiplexed on one RE.  **Proposal 1:** Discuss which method is more applicable from RAN4 performance requirements testing point of view. |
| R4-2007228 | Huawei, HiSilicon | Rel-15 CR with the following changes for TS 38.101-4:   * Add the clarification to make the definition of EPRE power ratio clear. |

## Open issues summary

**Issue 1-1: DL channel signal power ratios in TS 38.101-4**

* Background/Current status:
  + Agreement from RAN4#94-e-Bis
    - Specify antenna port to physical antenna mapping in Annex B.4.1.
    - Clarification on definition of EPRE will be provided in Table C.3.1-1 and Table C.5.1-1:
      * Companies are encouraged to check EPRE definition in TS 38.214 (i.e. per port or for all ports, before or after precoder etc.)
    - EPRE ratios in Annex C are determined such that *powerControlOffset* and *powerControlOffsetSS* are set to 0
* Proposals
  + Option 1: Keep existing configuration of EPRE ratio (QC, HW)
    - Option 1a: Clarify that EPRE ratio of PDSCH to PDSCH DMRS and PTRS to PDSCH are defined per port and EPRE ratio for other channels is defined per all ports (QC)
    - Option 1b: Clarify that (HW):
      * PDSCH EPRE is defined for all ports for “PDSCH to SSS” and “PDSCH OCNG to SSS”
      * CSI-RS EPRE is defined for all ports for “CSI-RS to SSS”
  + Option 2: Modify existing configuration to make EPRE ratio per port and before precoder. (Intel, R&S, HW)
* Recommended WF
  + Discuss above options

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Company A | Issue 1-1: TBA |
| Huawei, HiSilicon | Option 1a:  - Note 1 in Table C.3.1-1 and Table C.5.1-1 gives the clear reference defined in core specification TS 38.214 about the PDSCH EPRE to PDSCH DMRS EPRE ratio, no additional clarification is needed to add Note 2 in Table C.3.1-1 and Note 3 in Table C.5.1-1;  - Additional Note 2 in Table C.5.1-1 can be added for EPRE ratio of PT-RS to PDSCH to refer to Table 4.1-2 of TS 38.214;  - Both per port and per all ports for different DL physical channel or signal EPRE ratio in the table, it is better to unify either per port or per all ports.  Generally, it is better to define EPRE ratio from the testing point of view to make the test setup easier. |
| Rohde & Schwarz | From our point of view, defining the power per port and before the precoder is the more straight forward option and makes it clearer for the TE implementation. Before further discussing how to implement in the various CRs, lets clarify this point. |
| Intel | We think that unified definition of all EPRE ratios will be easier for understanding of test configuration. Per port and before precoder configuration provide more detailed description in comparison to per all ports. |

### CRs comments collection

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| **CR number** | **Comments collection** |
| *Channel mapping and EPRE configuration* | |
| R4-2006134 | Company A: TBA |
| Company B: TBA |
| Rohde & Schwarz: See comments on open issues, clarify EPRE definition, then discuss how to implement in the spec. |
| R4-2006524 | Huawei:  1: Changed the section B.4 title from “Beamforming Model” to “Physical signals and channels mapping and precoding”, but the name in the test parameter tables is still “Beamforming Model ”  2: Two physical antenna will be used for CSI and SDR as per the agreement reached in last meeting, this can be reflected by “using a precoder matrix  of size 2x1”, it is better to specifically set = 2;  2: PDCCH index 0 and 2 for CSI reporting (Clause 6 and 8) and SDR requirements (5.5/5A, 7.5/5A) |
| Ericsson: Change B.4 header to “Physical signals, channel mapping and precoding” |
| Rohde & Schwarz: We think using a “beamforming model” row on top of the precoding is confusing. We prefer our CR to clarify that the precoding refers to Annex B.4. Ericssons wording proposal is ok for us. |
| Intel:   1. @All: We added beamforming model configuration in the PDSCH and PDCCH requirements to align with CSI requirements. We can make it aligned with wording of Section B.4. In this case changes for CSI requirements are needed. 2. @Ericsson: Header “Physical signals, channel mapping and precoding” is also fine for us 3. @Huawei (bullet 2): Proposal is not clear. We think that for CSI we need to clarify which physical antenna indexes will be used for PDCCH transmission. Therefore, we added specific description for PDCCH precoding for CSI requirements. As for SDR, we can add that this specific section for PDCCH precoding is applicable to SDR also. 4. @Huawei (bullet 3): Information about precoder index can be added in each test where it is required. Our CR does not cover SDR and CSI with static channel. |
| R4-2006959 | Huawei:  Section B.4 title is updated to “Physical Channel mapping and Precoding”, but the reference in test parameters table “Note 4: Precoding configuration as specified in Annex B.4.1” |
| QC: Some of the changes such as Annex C, precoder config needs to be merged with other companies’ CRs. For FR1 SDR tests, this change only applies to 2Tx case. In case of 4Tx, this will be different. For FR1 CSI reporting tests, for fading also, it should be limited to 2x1 precoder. Although, if Intel’s CR for Annex B.4.1 is agreed, that kind of clarification may not be needed. |
| Intel:   1. Changes are overlapped with our CR R4-2006524. We can further discuss how split the work. 2. “PDCCH & PDCCH DMRS Precoding configuration” inside “PDCCH configuration” looks rather confusing. Probably we can have dedicated field for this configuration, i.e. similar to “PDSCH and PDSCH DMRS Precoding configuration” 3. Approach to capture information about Precoder configuration is different from CSI approach. Need further discuss which approach will be used for all sections 4. Based on our understanding “EPRE ratio between PDSCH and SSS” should be equal to 0 in case it defined per port and before precoder, because all power scaling factors for scenarios with different number of MIMO layers are already included in the precoder matrices. |
| R4-2007228 | Huawei: Mirror CR for Rel-16 is needed. |
| QC: In principle, we are ok with Option 2 since Option 2 aligns with how RAN1 has defined the EPRE ratios. For wording, we prefer our version of the tables in R4-2006134. |
| Rohde & Schwarz: See comments on open issues, clarify EPRE definition, then discuss how to implement in the spec. Some of the info however now seems redundant with what will be captured in Annex B.4 by Intel and R&S CR. |
| Intel: We prefer Option 1. However, as we agreed in the previous meeting “Mapping to antenna ports” will be defined in section B.4.1. Also, similar to R&S CR, we think that “EPRE ratio between PDSCH and SSS” should be equal to 0 |
| *Other* | |
| R4-2006688 | LG: Mirror CR for Rel-16 is needed. |
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| R4-2006069 | QC: Looks ok as long as DCI for CSI reporting is sent in the same slot as CSI-RS. |
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| R4-2006541 | Ericsson: Since we’ve introduced 2D antenna arrays for Rel-16 it could be good to also specify N1, and N2 values for legacy Rel-15 cases. Please see our Rel-16 CR (R4-2007924) from Enhanced performance WI. |
| Intel: In the beginning of B.2.3.2, the following sentence is captured “the N antennas are indexed by (N1, N2, P)” Therefore, we suggest to use the following description for example “4 (2,1,2) x 2 case” |
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| R4-2007226 | Huawei: Mirror CR for Rel-16 is needed. |
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## Summary for 1st round

### Open issues

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| **Status summary** |
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### CRs

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| **CR number** | **CRs/TPs Status update recommendation** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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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 #2: Rel-15 NR maintenance - BS demodulation requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2006048 | Nokia, Nokia Shanghai Bell | Rel-15 CR for TS 38.104 implementing endorsed Draft CR R4-2005521. |
| R4-2006049 | Nokia, Nokia Shanghai Bell | Rel-15 CR for TS 38.141-2 implementing endorsed Draft CR R4-2005522. |
| R4-2006050 | Nokia, Nokia Shanghai Bell | Rel-16 Cat A CR of R4-2006048 |
| R4-2006051 | Nokia, Nokia Shanghai Bell | Rel-16 Cat A CR of R4-2006049 |
| R4-2006838 | Ericsson | Rel-16 CR with the following changes for TS 38.104:   * Replace wrong table with right one based on Rel-15 sepecifcation. |
| R4-2007461 | Keysight Technologies UK Ltd | Rel-15 CR for TS 38.104 implementing endorsed Draft CR R4-2005469. |
| R4-2007462 | Keysight Technologies UK Ltd | Rel-16 Cat A CR of R4-2007461 |
| R4-2007463 | Keysight Technologies UK Ltd | Rel-15 CR for TS 38.141-1 implementing endorsed Draft CR R4-2005519. |
| R4-2007464 | Keysight Technologies UK Ltd | Rel-16 Cat A CR of R4-2007463 |
| R4-2007465 | Keysight Technologies UK Ltd | Rel-15 CR for TS 38.141-2 implementing endorsed Draft CR R4-2005520. |
| R4-2007466 | Keysight Technologies UK Ltd | Rel-16 Cat A CR of R4-2007465 |
| R4-2008099 | Ericsson | Rel-15 CR with the following changes for TS 38.104:   * Remaining brackets and TBDs are removed. |
| R4-2008100 | Ericsson | Rel-16 CR with the following changes for TS 38.104:   * Remaining brackets and TBDs are removed. |

## Open issues summary

N/A

## Companies views’ collection for 1st round

### Open issues

N/A

### CRs comments collection

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| **CR number** | **Comments collection** |
| R4-2006838 | Company A: TBA |
| Company B: TBA |
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| R4-2008099 | Huawei: Just void section 6.7.2.2 and 6.7.3.3 is better than addition of wording “No additional requirements.” |
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| R4-2008100 | Huawei: The current version in the coversheet is incorrect, it should be 16.3.0; Just void section 6.7.2.2 and 6.7.3.3 is better than addition of wording “No additional requirements.” |
| Nokia:  R4-2008100 duplicates the [] removals from Nokia’s CR [R4-2006058](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006058.zip" \t "_blank) concerning 38.104, section 11.2.2. Nokia’s R4-2006058 is the CR corresponding the endorsed draftCR R4-2003898 from last meeting, which is used to remove the remaining [] pertaining to the new “MCS12” requirements in NR\_perf\_enh. It is discussed in email thread “[95e][324] NR\_perf\_enh\_Demod\_BS”. We believe it to be more logical to use CR [R4-2006058](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006058.zip" \t "_blank) to clean this part of the specification, than using the general clean-up CR proposed by Ericsson. |
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| *CRs implementing endorsed Draft CRs in RAN4 #94-e-bis.* | |
| R4-2006048 |  |
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| R4-2006049 |  |
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| R4-2007461 |  |
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| R4-2007463 |  |
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| R4-2007465 |  |
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## Summary for 1st round

### Open issues

N/A

### CRs

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| **CR number** | **CRs/TPs Status update recommendation** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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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: Rel-16 LTE requirements maintenance

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2007178 | NTT DOCOMO, INC. | Rel-16 CR for TS 36.104 implementing endorsed Draft CR R4-2003632 |
| R4-2007179 | NTT DOCOMO, INC. | Rel-16 CR for TS 36.141 implementing endorsed Draft CR R4-2003633 |
| R4-2007180 | NTT DOCOMO, INC. | Rel-16 CR for TS 36.104 implementing endorsed Draft CR R4-2003634 |
| R4-2007181 | NTT DOCOMO, INC. | Rel-16 CR for TS 36.104 implementing endorsed Draft CR R4-2003635 |

## Open issues summary

N/A

## Companies views’ collection for 1st round

### Open issues

N/A

### CRs comments collection

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| **CR number** | **Comments collection** |
| R4-2007178 |  |
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| R4-2007179 |  |
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| R4-2007180 |  |
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| R4-2007181 |  |
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## Summary for 1st round

### Open issues

N/A

### CRs

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| **CR number** | **CRs/TPs Status update recommendation** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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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 #4: LTE requirements maintenance (up to Rel-15)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2007213 | Huawei, HiSilicon | Rel-15 CR with the following changes for TS 36.104:   * According to the simulation results of each company,we update the probability of detection for FeNB-IOT NPRACH TDD shall be equal to or exceed 99% for the SNR levels listed in Table 8.5.3.2.1-2.   + Add the STD from ideal results to companies’ averaged values with impairments as the final FeNB-IoT NPRACH TDD format0 and format1 performance requirements. |
| R4-2007214 | Huawei, HiSilicon | Rel-16 Cat A CR of R4-2007213 |
| R4-2007215 | Huawei, HiSilicon | Rel-15 CR with the following changes for TS 36.141:   * According to the simulation results of each company,we update the probability of detection for FeNB-IOT NPRACH TDD shall be equal to or exceed 99% for the SNR levels listed in Table 8.5.3.5-2.   + Add the STD from ideal results to companies’ averaged values with impairments as the final FeNB-IoT NPRACH TDD format0 and format1 performance requirements. |
| R4-2007216 | Huawei, HiSilicon | Rel-16 Cat A CR of R4-2007215 |
| R4-2007217 | Huawei, HiSilicon | Summary of simulation results for Rel-15 FeNB-IoT NPRACH TDD formats |
| R4-2007366 | Ericsson | Simulation results on NB-IoT NPRACH demodulation performance for TDD |
| R4-2007218 | Huawei, HiSilicon | Rel-15 CR with the following changes for TS 36.101:   * Remove the square brackets of SNR point@ 70% maximum throughput in Table 8.12.1.2.1-2; Table 8.12.1.2.2-2; Table 8.12.1.2.3-2; Table 8.12.2.2.1-1; Table 8.12.2.2.2-1. |
| R4-2007219 | Huawei, HiSilicon | Rel-16 Cat A CR of R4-2007218 |
| R4-2007242 | Huawei, HiSilicon | Rel-8 CR with the following changes for TS 36.141:   * Corrected SRS transmission subframe for TDD in Table 8.2.2.4.2-2. |
| R4-2007243 | Huawei, HiSilicon | Rel-9 Cat A CR of R4-2007242 |
| R4-2007244 | Huawei, HiSilicon | Rel-10 Cat A CR of R4-2007242 |
| R4-2007245 | Huawei, HiSilicon | Rel-11 Cat A CR of R4-2007242 |
| R4-2007246 | Huawei, HiSilicon | Rel-12 Cat A CR of R4-2007242 |
| R4-2007247 | Huawei, HiSilicon | Rel-13 Cat A CR of R4-2007242 |
| R4-2007248 | Huawei, HiSilicon | Rel-14 Cat A CR of R4-2007242 |
| R4-2007249 | Huawei, HiSilicon | Rel-15 Cat A CR of R4-2007242 |
| R4-2007250 | Huawei, HiSilicon | Rel-12 CR for TS 36.104 implementing endorsed Draft CR R4-2005523 |
| R4-2007251 | Huawei, HiSilicon | Rel-13 Cat A CR of R4-2007250 |
| R4-2007252 | Huawei, HiSilicon | Rel-14 Cat A CR of R4-2007250 |
| R4-2007253 | Huawei, HiSilicon | Rel-15 Cat A CR of R4-2007250 |
| R4-2007254 | Huawei, HiSilicon | Rel-16 Cat A CR of R4-2007250 |
| R4-2007255 | Huawei, HiSilicon | Rel-15 CR for TS 36.104 implementing endorsed Draft CR R4-2005524 |
| R4-2007256 | Huawei, HiSilicon | Rel-16 Cat A CR of R4-2007255 |

## Open issues summary

N/A

## Companies views’ collection for 1st round

### Open issues

N/A

### CRs comments collection

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| **CR number** | **Comments collection** |
| R4-2007213 | Huawei:  Draft summary of R4-2007217 was uploaded into the draft folder with results submitted by companies before and new results from Ericsson. Companies can double check the results, if any further updates are needed.  @Ericsson, could you add the impairment results if possible so that we can derive the SNR requirements during this meeting.  Further revision is needed by taking into account results from Ericsson R4-2007366. |
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| R4-2007215 | Huawei: Further revision is needed by taking into account results from Ericsson R4-2007366. |
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| R4-2007218 | Huawei: Further revision is needed by taking into account results from Ericsson R4-2007366. |
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| R4-2007242 | [Moderator]: Why mirror CRs are requested for up to Rel-15? Do you need Rel-16 mirror CR? |
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| *CRs implementing endorsed Draft CRs in RAN4 #94-e-bis.* | |
| R4-2007250 |  |
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| R4-2007255 |  |
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## Summary for 1st round

### Open issues

N/A

### CRs

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| **CR number** | **CRs/TPs Status update recommendation** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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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”* |