3GPP TSG-RAN WG4 Meeting #113 R4-2419606

Orlando, US, 18th – 22nd November, 2024

**Agenda item:** 5.1.3

**Source:** Moderator (Apple)

**Title:** Topic summary for [113][319] Demod\_Maintenance\_Part2

**Document for:** Information

# Introduction

This topic summary covers Rel-18 demodulation maintenance and TEI. The following AIs are covered:

5.10.2 Demodulation performance and CSI requirements (Requirement for NR FR2 multi-Rx chain DL reception)

5.14.2 Demodulation performance requirements (Enhanced NR support for high speed train scenario in frequency range 2)

5.17.2 Advanced receiver to cancel inter-user interference for MU-MIMO demodulation requirements

5.17.3 Absolute physical layer throughput requirements with link adaptation

5.19.2 BS demodulation performance requirements (Further NR coverage enhancements)

5.21.4.1 SAN demodulation performance requirements (NR NTN enhancement)

5.21.4.2 UE demodulation performance and CSI requirements (NR NTN enhancement)

5.25.2 Demodulation performance requirements (NR MIMO evolution for downlink and uplink)

5.26.2 Demodulation performance requirements (Enhanced support of reduced capability NR devices)

5.27.2 UE demodulation performance and CSI requirements (Network energy saving for NR)

5.28.3 Demodulation performance requirements (IoT (Internet of Things) NTN (non-terrestrial network) enhancements)

5.29.4 Demodulation performance requirements (NR Network-controlled Repeaters)

5.30.3 Demodulation performance requirements (Mobile IAB (Integrated Access and Backhaul) for NR)

5.31.1 UE demodulation performance requirements (Enhancement of NR dynamic spectrum sharing)

5.32.4 Demodulation performance and CSI requirements (Other Rel-18 non-spectrum related WIs)

5.33.3 BS RF, demodulation performance and other topics (Rel-18 TEI)

# Topic #1: NR FR2 Multi-RX

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| R4-2418545 | Apple | **On PT-RS config for multi-TRP demod requirements in FR2**   1. *The PT-RS RE offset for RE mapping is determined by DMRS port and resource element offset configuration.* 2. *Configuring the same resource element offset configuration for the PDSCH with different DMRS ports would result in different PT-RS RE offset for the 2 PDSCH.* 3. *The PT-RS configuration is a per BWP configuration and cannot be configured differently for 2 PDSCH in multi-DCI transmission scheme.* 4. **For multi-DCI fully overlapping demod requirements update the PT-RS configuration to have the same resource element offset for both TRP.** 5. *For single DCI transmission current configuration for test 1-2 configures PT-RS from each TRP.* 6. *For single DCI transmission only 1 PT\_RS can be configured for single PDSCH transmission.* 7. *The enhancement for PT-RS with single DCI SDM transmission is to configure 2 port PT-RS - one port per TRP.* 8. **For single-DCI SDM transmission scheme requirements update the PT-RS configuration as (1) Single PT-RS config for both TRP, (2) For test 1-2 with PT-RS transmission from each TRP, maxNrofPorts should be set to n2.** |
| R4-2418556 | Apple | **CR to 38.101-4 on PT-RS config update for PDSCH demod requirements with multi-RX in FR2**  Updated PT-RS config for Multi-RX demod and PMI requirements  Removed “[ ]” for mDCI requirements. |

## Open issues summary

### Update to PT-RS configuration for FR2 Multi-TRP requirements

*Sub-topic description:*

* The PT-RS RE offset for RE mapping is determined by DMRS port and resource element offset configuration.
* Configuring the same resource element offset configuration for the PDSCH with different DMRS ports would result in different PT-RS RE offset for the 2 PDSCH.
* The PT-RS configuration is a per BWP configuration and cannot be configured differently for 2 PDSCH in multi-DCI transmission scheme.
  + Currently 2 different PT-RS configurations are used for multi-DCI mTRP requirements
* For single DCI transmission current configuration for test 1-2 configures PT-RS from each TRP.
* For single DCI transmission only 1 PT\_RS can be configured for single PDSCH transmission.
* The enhancement for PT-RS with single DCI SDM transmission is to configure 2 port PT-RS - one port per TRP.
  + Currently 2 PT-RS one from each TRP are configured for test 2 PT-RS.

**Issue 1-1-1: Update PT-RS configuration for FR2 multi-DCI mTRP requirements**

* Proposals
  + Option 1: For multi-DCI fully overlapping demod requirements update the PT-RS configuration to have the same resource element offset for both TRP (Apple)
  + Other options not precluded
* Recommended WF
  + More discussion needed.

**Issue 1-1-2: Update PT-RS configuration for FR2 single-DCI mTRP requirements**

* Proposals
  + Option 1: For single-DCI SDM transmission scheme requirements update the PT-RS configuration as (1) Single PT-RS config for both TRP, (2) For test 1-2 with PT-RS transmission from each TRP, maxNrofPorts should be set to n2
  + Other options not precluded
* Recommended WF
  + More discussion needed.

# Topic #2: Enhancements to FR2 HST

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| R4-2418964 | Huawei, HiSilicon | **(NR\_HST\_FR2\_enh-Perf) CR on UE CA demodulation requirements**  Modify PDCCH configuration for some UE CA demodulation requirements. |
| R4-2419344 | Nokia | **CR on UE Capability for HST FR2 with multi-Rx**  Replacing *simultaneousReceptionFR2HST-r18* in Table 7.1.1.3-1 with *simultaneousReceptionTwoQCL-r18* and removing the corresponding square brackets |

## Open issues summary

None

# Topic #3: Demodulation performance evolution

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| R4-2417806 | MediaTek inc. | **CR for TS38.101-4 corrections on Rel-18 MU-MIMO requirements**  Add missing references to co-scheduled UE information in DCI (Table 7.3.1.2.2-12 of TS38.212) and fix minor typo in Table 5.2.3.1.16-5 caption |
| R4-2418547 | Apple | **Clarification on default assumptions for MU-MIMO with advanced receiver**   1. *There is no assumption for wideband precoding in RAN1 spec or RAN2 NWA for MU-MIMO.* 2. *In some companies’ opinion there is an implicit assumption from Rel-15 that wideband precoder is not used with MU-MIMO* 3. *In some other companies’ opinion, it is not precluded to have MU-MIMO with wideband precoding.* 4. **Seek feedback from NW vendors if implicit assumption from Rel-15 – wideband precoders not used with MU-MIMO scheduling can be used for advanced receivers with MU-MIMO.** 5. **In case the implicit assumption is not valid, RAN4 to discuss updating the default assumption for advanced receiver with MU-MIMO.** |
| R4-2418799 | China Telecom | **Updates to Enhanced Receiver Type 2 definition**  Introduce ‘Type 2-1’, ‘Type 2-2a’ and ‘Type 2-2b’ titles for the 3 sub-types of Enhanced Receiver Type 2 |

## Open issues summary

### Clarification on default assumptions for MU-MIMO with advanced receiver

*Sub-topic description:*

* There is no assumption for wideband precoding in RAN1 spec or RAN2 NWA for MU-MIMO.
* In some companies’ opinion there is an implicit assumption from Rel-15 that wideband precoder is not used with MU-MIMO
* In some other companies’ opinion, it is not precluded to have MU-MIMO with wideband precoding.

**Issue 3-1-1: On default assumptions for MU-MIMO with advanced receiver for WB precoding**

* Proposals
  + Option 1: Seek feedback from NW vendors if implicit assumption from Rel-15 – wideband precoders not used with MU-MIMO scheduling can be used for advanced receivers with MU-MIMO. (Apple)
  + Option 2: In case the implicit assumption is not valid, RAN4 to discuss updating the default assumption for advanced receiver with MU-MIMO. (Apple)
  + Other options not precluded
* Recommended WF
  + More discussion needed.

# Topic #4: Further Coverage Enhancements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| R4-2417795 | China Telecom | **Summary of simulation results for further NR coverage enhancements**  Moderator’s note: No new simulation results submitted for results collection |
| R4-2418940 | Samsung | **CR on test requirements for multiple PRACH transmission in TS 38.141-2**  Remove the [] for requirement |
| R4-2419255 | Ericsson | **CR for 38.104 on multiple PRACH transmission demodulation requirements**  • Remove brackets of SNR values.  • Editorial error correction. |

## Open issues summary

None

# Topic #5: NR NTN enhancement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| **SAN Demod** | | |
| [R4-2417557](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417557.zip) | Nokia | **(NR\_NTN\_enh-Perf) CR on PUSCH demodulation requirements for 38.181**  Inclusion of some results from R4-2408978 in square brackets  Moderator’s Note: overlaps with some changes in R4-2418937. Also not the latest summary of results was used for the requirements. |
| [R4-2417558](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417558.zip) | Nokia | **Updated Rel-18 NTN simulation results**  Updated simulation results |
| [R4-2417842](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417842.zip) | CATT | **CR for TS 38.108, On Performance requirements for PRACH for Ka-band NTN**  Update SNR value and remove [] for SNR value. |
| [R4-2417843](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417843.zip) | CATT | **CR for TS 38.81, On Performance requirements for PRACH for Ka-band NTN**  Update SNR value and remove [] for SNR value. |
| [R4-2418937](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418937.zip) | Samsung | **CR on performance requirements for PUSCH in TS 38.181**   * Add new sections under test requirement section for SAN type 1-O and 2-O, and update the related table index * Remove [] for requirement * Remove [] for Propagation conditions and correlation matrix * Correct the clause number in mimimum requirement section   Moderator’s Note: overlaps with R4-2417557 |
| [R4-2418938](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418938.zip) | Samsung | **CR on performance requirements for PUSCH with DM-RS bundling**  Remove the [] in the requiirement - 38.108 |
| [R4-2418939](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418939.zip) | Samsung | **Discussion on SNR requirement derivation for NTN enhancement**  Proposal 1: Discussion the rule for how to derive the requirement for those cases with ideal simulation results span large than 2dB, in case there is no enough input with well aligned. Either relaxing the span from 2dB to [2.5] dB, or additional marginal could be considered in case-by-case manner. |
| [R4-2419256](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419256.zip) | Ericsson | **Simulation results for FR2-NTN PUCCH format 4**  Updated simulation results |
| [R4-2419257](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419257.zip) | Ericsson | **CR for 38.108 on FR2-NTN PUCCH demodulation requirements**   * New SNR values for FR2-NTN PUCCH format 3. * Replace TBD by SNR values for FR2-NTN PUCCH format 4. |
| [R4-2419258](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419258.zip) | Ericsson | **CR for 38.181 on FR2-NTN PUCCH demodulation requirements**  The FR2-NTN PUCCH format 3 requirment values are not aligned with the latest simulation results. The FR2-NTN PUCCH format 4 demodulation requirements are missing. |
| **UE Demod** | | |
| [R4-2418967](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418967.zip) | Huawei,HiSilicon | **(NR\_NTN\_enh-Perf) CR on UE demodulation requirements**  Specify K\_offset in the test parameters. |
| [R4-2419336](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419336.zip) | Ericsson | **CR to 38101-5 Correction on the NTN demodulation requirements**   1. Replace ‘TBD’ with correct information 2. Add correct reference number 3. Correct the description at the beginning of the chapter |

## Open issues summary

### SNR derivation

*Sub-topic description:*

* For some PUCCH test cases requirements are TBD due to large span

**Issue 5-1-1: On SNR derivation**

* Proposals
  + Option 1: Discussion the rule for how to derive the requirement for those cases with ideal simulation results span large than 2dB, in case there is no enough input with well aligned. Either relaxing the span from 2dB to [2.5] dB, or additional marginal could be considered in case-by-case manner. (Samsung)
  + Other options not precluded
* Recommended WF
  + Moderator suggestion - Update summary spreadsheet based on submitted results in this meeting and further discuss SNR derivation
  + No TDoc was reserved for results summary. Request Huawei to share updated summary based on updated results this meeting.

# Topic #6: MIMO Evolution for UL and DL

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| [R4-2417807](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417807.zip) | MediaTek inc. | **CR for TS38.101-4 corrections on MIMO evolution requirements**  The expression for configurations of ZP CSI-RS and NZP CSI-RS are differnet in CQI, PMI and RI requirements. Also, according to “Table 7.4.1.5.3-1: CSI-RS locations within a slot.” in TS38.211, there is no k1 or l1 in some CSI-RS resource configurations.  • Modify FR1 2RX FDD Chapters 6.3.2.1.8  • Modify FR1 2RX TDD Chapters 6.3.2.2.9  • Modify FR1 4RX FDD Chapters 6.3.3.1.8  • Modify FR1 4RX TDD Chapters 6.3.3.2.8 |
| [R4-2418618](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418618.zip) | Samsung | **CR on applicability rules for Rel-18 enhanced DMRS**  The summary of changes in this CR as below:   * update requirements in Clause 5.1.1.3 |
| [R4-2418960](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418960.zip) | Huawei, HiSilicon | **(NR\_MIMO\_evo\_DL\_UL-Perf) CR on UE demodulation and CSI requirements**  1. Specify DMRS ports for the enhanced DMRS requirements.  2. Modify Aperiodic Report Slot Offset to satisfy Note 3. |

## Open issues summary

None

# Topic #7: Enhanced RedCap

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| [R4-2418959](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418959.zip) | Huawei, HiSilicon | **(NR\_redcap\_enh-Perf) CR on UE CSI requirements**  Modify CQI/RI/PMI delay to satisfy Note 2. See R4-2418944 for details. |
| [R4-2418990](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418990.zip) | Ericsson | **CR to 38.101-4: Editorial correction of eRedCap UE demodulation and CSI reporting requirements**   1. Clarified the HD-FDD mode configuration is applicable for eRedCap. 2. Correction from RedCap to eRedCap. 3. Rename ‘RedCap enhancements’ to ‘eRedCap’ in CQI test to align the section title with other eRedCap requiremets.   Table number correction in 6.2.2.2.2.5. |
| [R4-2419547](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419547.zip) | MediaTek inc. | **CR for Rel-18 TS38.101-4, alignments on the expression of CSI-RS conigurations for RedCap enhancement requirements**  Align the expression for configuraitons of ZP CSI-RS and NZP CSI-RS in Caluse 6.2.4 with that in other Clauses |

## Open issues summary

None

# Topic #8: Network Controlled Repeaters

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| [R4-2419341](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419341.zip) | Nokia | **CR on Correlation Matrix of NCR Demodulation in 38.106**  Revising the R\_spat correlation matrices in Table C.2.4.2.2-3 |
| [R4-2419342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419342.zip) | Nokia | **CR on Correlation Matrix of NCR Demodulation in 38.115-1**  Revising the R\_spat correlation matrices in Table G.2.4.2.2-3 |
| [R4-2419343](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419343.zip) | Nokia | **CR on Correlation Matrix of NCR Demodulation in 38.115-2**  Revising the R\_spat correlation matrices in Table I.2.3.1.1-3 |

## Open issues summary

None

# Topic #9: Enhanced DSS

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| R4-2419334 | Ericsson | **CR to 38.101-4: Clean up for the PDCCH requirements for DSS enhancement**   1. Correct the CCE to REG mapping type 2. Correct the typos |

## Open issues summary

None

# Topic #10: Other Rel-18 Maintenance

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| [R4-2417773](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417773.zip) | Qualcomm Incorporated | **Adding missing performance requirements for 6/7/8 MHz channel bandwidths for LTE-based 5G terrestrial broadcast [R18][Cat.F]**  Extending existing performance requirements for 10 MHz to new channel bandwidths 6/7/8 MHz |
| [R4-2418004](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418004.zip) | Qualcomm Technologies Ireland | **On missing performance requirements for LTE-based 5G terrestrial broadcast**  Observation: The reference measurement channels for LTE-based 5G terrestrial broadcast for 10 MHz can be easily extended to 6, 7 and 8 MHz while keeping the channel code rate (almost) constant. That allows reusing the existing SNR requirements without running new simulations.  Proposal: We propose to adapt the enhancements of the RMCs for 10 MHz as defined in [3] to complete the work item on LTE-based 5G terrestrial broadcast part 2 [1]. |

## Open issues summary

### Requirements for new bands for LTE-based 5G terrestrial broadcast

*Sub-topic description:*

* New bands and bandwidths for LTE-based 5G terrestrial broadcast have been introduced but no performance requirements are defined so far.

**Issue 5-1-1: Extending requirements to new bands**

* Proposals
  + Option 1: Adapt the enhancements of the RMCs for 10 MHz to complete the work item on LTE-based 5G terrestrial broadcast part 2 (Qualcomm)
  + Other options not precluded
* Recommended WF
  + To be discussed

# Topic #11: Rel-18 TEI

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations/ Summary of change** |
| R4-2419254 | Ericsson | **[HAPS PRACH] CR for 38.104 on NR PRACH format 1 demodulation requirements**  • Adding FR1 PRACH format 1 demodulation requirements.  • Adding PRACH configurations.  Resubmission of agreed CR from RAN4#112 which was not implemented due to incorrect file uploaded. |

## Open issues summary

None