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

**Electronic Meeting, 25 May - 5 June, 2020**

**Agenda item:** 6.12.4

**Source:** Moderator (China Telecom)

**Title:** Email discussion summary for [95e][320] NR\_DL256QAM\_FR2\_Demod

**Document for:** Information

# Introduction

This email thread discusses the demodulation and CSI reporting requirements for FR2 DL 256QAM in agenda 6.12.4.

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

* 1st round: Invite companies to review the recommended WF in each sub-topic, and provide comments (if any) in section 1.3, 2.3 and 3.3.
* 2nd round: TBA

# Topic #1: PDSCH normal demodulation requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2006041 | China Telecom | The following observations and proposals were given for PDSCH demodulation requirements:  Proposal 1: Assume 3% Tx EVM in the simulation.  Proposal 2: Not specify Rx EVM in the simulation.  Proposal 3: Use rank 1.  Observation 1: Based on our simulation results for MCS 20 and 100MHz bandwidth with full PRB allocation, the SNR under typical NLOS fading channels is testable in FR2.  Proposal 4: Use TDLA30-300 fading channel.  Proposal 5: Use either option 1 or option 2 for channel bandwidth and PRB allocation, i.e., 100MHz CBW with full or partial PRB allocation.  Proposal 6: Use MCS 20 or higher MCS depending on the allocated PRB number.  Proposal 7: Define FR2 256QAM demodulation requirements in a band agnostic way.  Proposal 8: Use option for DMRS configuration, i.e., DMRS 1+1.  Proposal 9: Use option 1 for PRB bundling size and precoding model   * PRB bundling size: 2 * Precoding model: Random Precoding, per slot, WB granularity |
| R4-2006529 | Intel Corporation | Proposal 1: Define FR2 256QAM performance requirements in band agnostic manner for the following assumptions:   * CBW 50 MHz with full allocation * Propagation conditions: Static * Antenna configuration: 1x2 * Type 1 single symbol front loaded, 1 additional DMRS * Rank 1, MCS 21 |
| R4-2007138 | NTT DOCOMO, INC. | Proposal 1: Define DL 256QAM demodulation performance requirements both for rank 1 and rank 2  Proposal 2: Consider following options for propagation condition for FR2 DL 256QAM   * For Rank 1 * Opt.1: Static channel, Opt.2: TDLD (30-35 or 30-75), Opt.3 TDLA(30-300) * For Rank2 (if supported) * Opt.1: TDLD (30-35) * Other options are not precluded   Proposal 3: Rx EVM is not specified for FR2 DL 256QAM  Proposal 4: Adopt Tx EVM requirements for FR2 DL 256QAM as 2% |
| R4-2007230 | Huawei, HiSilicon | Observation 1: For NR DL 256QAM for FR2, the maximum testable SNR is 22.6dB for 50MHz bandwidth and 19.4dB for 100MHz bandwidth respectively.  Observation 2: For PDSCH test, after adding 0.5dB margin, only MCS20/21 for AWGN and MCS20 for TDL-D30-35 is feasible, i.e. less than the maximum testable SNR 22.6dB for 50MHz bandwidth.  Proposal 1: RAN4 should define the performance requirements for NR DL 256QAM for FR2 based on the scenario satisfying the demand that required SNR is less than 22.6dB for 50MHz bandwidth and 19.4dB for 100MHz bandwidth respectively.  Proposal 2: Select the following parameter for simulation assumption and requirements definition.   |  |  | | --- | --- | | Parameter | Value | | Tx EVM | 3% | | Rx EVM | Not Specified | | MIMO configuration | 2Tx 2Rx ULA low | | Channel bandwidth | 50MHz with full PRB allocation | | DM-RS configuration | 1+1 | | PRB bundling size | 2 | | Precoding model | Random | | HARQ process number | 8 | | MCS | 20 | | Propagation condition | TDL-D30-35 | | Rank | 1 | |
| R4-2007920 | Ericsson | [Start of Text Proposal]  7 Demod test challenge for DL 256QAM  Editor’s note: This clause will capture the study for highlighting demod test challenge which will have no impact to define the core requirement or start the normative work.  The SNR levels expected at the UE reference point needed for radiated demodulation and CSI requirements, can be expressed using the following equation:  SNR=\frac{E\_s}{N\_{OC}}  The numerator represents samples of the wanted signal and the denominator AWGN generated in the test gear. The SNR is determined and fixed at the test gear and transmitter. The signal experienced at each receiver is as follows:  SNR=\frac{PL\ast E\_s}{(PL\ast N\_{OC}+P\_{RX})\ }  Where PL is the pathloss and PRX represents the power of the internal noise in the receiver. The pathloss is a property of the OTA chamber, and the maximum possible transmit power for the wanted signal and AWGN are determined by the test gear. NRX depends on the receiver sensitivity. Since the factors in the equation are limited by chamber and equipment performance, there is a limit to the SNR that can be tested at the receiver without experiencing substantial degradation at the receiver. At higher modulations, such as 256 QAM, the importance of SNR needed becomes significant.  Testability studies have indicated that the receiver maximum input level needed is considered to be of challenge where an estimated 26 to 34 dB is needed at the receiver in order to have a passing requirement or deemed not testable. Considerations of the conclusion based upon that the SNR operating point to see benefit of 256 QAM is [22] dB SNR at the BS with added pathloss conditions (depending on DNF or IFF test method), which creates an uncertainty whether UE demodulation requirements are fully testable.  For high SINR it is necessary to ensure low noise performance at the receiver, which can only be achieved if high SINR is achievable. Additionally, a robust UE baseband performance that does not create any SINR floor inside the baseband is ensured with appropriate UE demodulation testing.  7.1 Conclusion  It is uncertain whether UE demodulation requirements are testable using Rel-15 methods. Further test methods should therefore be studied and defined under testability SI.  [End of Text Proposal] |

## Open issues summary

### Sub-topic 1-1: Main parameters

**Issue 1-1-1: Tx EVM**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *Tx EVM*
    - *Option 1: 3%*
    - *Option 2: 3.5%*
    - *Option 3: 2%*
* Proposals
  + Option 1: 3% (CTC, Intel, Huawei)
    - CTC: The BS EVM core requirement for FR2 256QAM is agreed as 3.5%. As know, better EVM can be achieved in the test equipment. In Rel-15 NR single carrier PDSCH demodulation requirements, Tx EVM of 3% is used for FR1 256QAM simulation.
    - Intel: EVM requirements are same for FR1 and FR2
  + ~~Option 2: 3.5%~~
  + Option 3: 2% (DCM)
    - DCM: We have still concern on the feasibility to reuse existing assumption for LTE or NR FR1.
* Recommended WF
  + Can we use option 1 based on majority companies’ view?

**Issue 1-1-2: Rx impairment modelling and band agnostic requirements**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *Rx EVM*
    - *Option 1: 2%*
    - *Option 2: Not Specified*
    - *Option 3: Consider agreements from WF R4-1811394 as starting point and check if it is applicable to 256QAM discussion*
  + *Carrier frequency*
    - *Option 1: band agnostic*
    - *Option 2: Further analyze whether it is possible to define band agnostic requirements*
* Proposal
  + ~~Option 1: 2%~~
  + Option 2: Not explicitly model Rx impairment (CTC, DCM, Huawei)
    - CTC: Aligned with Rel-15 FR2 demodulation tests.
  + Option 3: Consider agreements from WF R4-1811394 as starting point and check if it is applicable to 256QAM discussion
    - Option 3a (Intel): Use model #1 phase model in WF R4-1811394 to check impact of explicit Rx PN modelling on 256QAM performance to understand whether and under which assumptions requirements can be defined in band agnostic manner. Observation from simulation results:
      * It is rather hard to define scenario with Rank 2 transmission which allows to have band agnostic requirements assuming methodology agreed for Rel-15 WI.
      * Band agnostic requirements can be considered for the following scenarios with Rank 1 transmission:
        + Static channel mode: MCS 20-23
        + TDL-D channel mode: MCS 20-21
        + TDL-A channel mode: MCS 20-21
* Recommended WF
  + For the following scenarios, not explicitly model Rx impairment, and define band agnostic requirements:
    - Static channel mode: MCS 20-23
    - TDL-D channel mode: MCS 20-21
    - TDL-A channel mode: MCS 20-21
  + For the other scenarios, FFS whether to explicitly model Rx impairment and define band agnostic requirements.

**Issue 1-1-3: Rank**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *Rank*
    - *Option 1: rank 1*
    - *Option 2: rank 1 and 2*
    - *Other options are not precluded*
* Proposal
  + Option 1: rank 1 (CTC, Intel, Huawei)
    - CTC: Rank 1 is also used in FR1 256 QAM demodulation test.
  + Option 2: rank 1 and 2 (DCM)
    - DCM: DL rank 2 transmission is one of typical configurations even for FR2.
* Recommended WF
  + Cover rank 1, and FFS on rank 2

**Issue 1-1-4: Channel bandwidth and PRB allocation**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *Channel bandwidth and PRB allocation*
    - *Option 1: 100MHz CBW with full PRB allocation*
    - *Option 2: 100MHz CBW with partial PRB allocation*
    - *Option 3: 50MHz CBW with full PRB allocation*
* Proposal
  + Option 1: 100MHz CBW with full PRB allocation (CTC)
  + Option 2: 100MHz CBW with partial PRB allocation (CTC)
    - CTC: 100MHz CBW is more typical for FR2 UE.
  + Option 3: 50MHz CBW with full PRB allocation (Intel, Huawei)
    - Intel: 1) Using of partial allocation does not allow to increase testable SNR, because unallocated resources will be occupied by OCNG signals and effectually all channel bandwidth will contain signals for transmission. 2) Full PRB allocation is baseline scenario for PDSCH requirements.
* Recommended WF
  + According to the UE feature list in TR 38.822, for FR2, the set of mandatory CBW is 50, 100, 200 MHz. So considering the testable SNR limit, can we agree with option 3?

**Issue 1-1-5: Propagation condition and MCS**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *Propagation condition*
    - *Option 1: Fading channel*
      * *Option 1a: TDLA30-300*
      * *Option 1b: TDLD30-75*
      * *Option 1c: TDL-D for Rank 1, TDL-D for Rank 2*
      * *Option 1d: TDL-A for Rank 1, TDL-D for Rank 2*
      * *Option 1e: TDLD30-35*
    - *Option 2: Static channel*
    - *TBD based on simulation results*
  + *MCS*
    - *Option 1: MCS 20 or higher depending on the allocated PRB number*
    - *Option 2: MCS 21*
    - *Option 3: MCS 20*
    - *Option 4: MCS 25/26/27*
    - *Other options are not precluded*
* Proposals on propagation condition for rank1
  + Option 1: Fading channel (CTC, DCM, Huawei)
    - Option 1A: TDLA30-300 (CTC, DCM)
      * CTC: 1) Some essential receiver algorithms such as channel estimation cannot be verified under static channel. 2) NLOS channel is more typical for demodulation tests. Note that LOS channel models including TDL-D and TDL-E have not been specified in TS 38.101-4. 3) The SNR under typical NLOS fading channels is testable in FR2.
    - Option 1B: TDLD30-75 (DCM)
    - Option 1C: TDLD30-35 (Huawei, DCM)
  + Option 2: Static channel (Intel, DCM)
    - Intel: Static channel, rank 1 and MCS 21 allows to achieve sufficient margin relative to the SNR limit.
* Proposals on MCS for rank 1
  + Option 1: MCS 20 or higher depending on the allocated PRB number (CTC)
    - CTC: Depending on whether full PRB or partial PRB allocation is used, we can use MCS 20 or higher MCS for 256QAM demodulation requirements.
  + Option 2: MCS 21 (Intel)
  + Option 3: MCS 20 (Huawei)
* Proposals on propagation condition for rank 2
  + Option 1: Fading channel
    - Option 1A: TDLD30-35 (DCM)
* Summary of companies’ ideal simulation results for FR2 256QAM demodulation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Rank | Channel Model | Antenna configuration | CBW (MHz) /PRB allocation (full/partial) | SNR point (dB) @70%TP (CTC/Intel/Huawei)  Using MCS index: | | | |
| 20 | 21 | 22 | 23 |
| 1 | Static | 1x2 | 50/full | 16.1 | 16.6 | 18.0 | 19.3 |
| 1 | Static | 2x2 | 50/full | 18.58 | 19.28 | 20.13 | 21.48 |
| 1 | TDLD30-35 | 2x2 | 50/full | 17.9/18.72 | 18.6/20.38 | 19.8/20.09 | 21.0/22.81 |
| 1 | TDLA30-300 | 2x2 | 50/full | 18.9 | 19.8 | 21.2 | 22.6 |
| 1 | TDLA30-300 | 2x2 | 100/full | 17.76 |  |  |  |
| 1 | TDLA30-75 | 2x2 | 100/full | 17.82 |  |  |  |
| 1 | TDLC60-300 | 2x2 | 100/full | 17.80 |  |  |  |
| 2 | Static | 2x2 | 50/full | 19.1/22.0 | 19.6/22.69 | 20.9/23.47 | 22.3/24.80 |
| 2 | TDLD30-35 | 2x2 | 50/full | 23.9 | 24.8 | 26.4 | 27.8 |
| 2 | TDLA30-300 | 2x2 | 50/full | 29.5 | 30.8 | 33.3 | 36.4 |

* + Observations from the simulation results
    - 2 companies provided ideal simulation results for rank1, TDLA30-300 and MCS 20, and the required SNR is 17.76/18.9dB.
    - 2 companies provided ideal simulation results for rank1, TDLD30-35 and MCS 20, and the required SNR is 17.9/18.72dB.
    - Considering around 2dB impairment margin and 0.8dB extra margin, at least the above two scenarios are testable under 50MHz CBW with full PRB allocation.
* Recommended WF
  + Propagation condition for rank1:
    - Based on the simulation results submitted to this meeting, can we agree to use fading channel? Down-selection to one of three options can be discussed in the next meeting based on more simulation analysis.
      * Option 1A: TDLA30-300
      * Option 1B: TDLD30-75
      * Option 1C: TDLD30-35
      * Note that the simplified delay profiles for TDL-D have not been specified in TS 38.101-4.
  + MCS for rank 1: MCS 20
  + Propagation condition and MCS for rank 2: FFS

**Issue 1-1-6: MIMO configuration**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *MIMO configuration*
    - *2Tx 2Rx ULA low*
    - *Other options are not precluded*
* Proposal
  + Option 1: 2Tx 2Rx ULA low (Huawei)
  + Option 2: 1Tx 2Rx (Intel)
* Recommended WF
  + Depend on the agreement on propagation condition in issue 1-1-5. Go with option 1 if it is agreed to use fading channel, and go with option 2 if it is agreed to use static channel.

### Sub-topic 1-2: Other parameters

**Issue 1-2-1: DM-RS configuration**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *DM-RS configuration*
    - *Option 1: Type 1 single symbol front loaded, 1 additional DMRS*
    - *Option 2: Type 1 single symbol front loaded, 0 additional DMRS*
* Proposal
  + Option 1: Type 1 single symbol front loaded, 1 additional DMRS (CTC, Intel, Huawei)
    - CTC: Option 1 is more typical for fading channels.
    - Intel: Based on TR 38.883, all feasibility study was done under assumptions of 1 additional DMRS.
  + Option 2: Type 1 single symbol front loaded, 0 additional DMRS
* Recommended WF
  + Option 1

**Issue 1-2-2: PRB bundling size and Precoding model**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *PRB bundling size and Precoding model*
    - *Option 1:*
    - *PRB bundling size: 2*
    - *Precoding model: Random Precoding, per slot, WB granularity*
    - *Other options are not precluded*
* Proposal
  + Option 1 (CTC, Huawei)
    - PRB bundling size: 2
    - Precoding model: Random Precoding, per slot, WB granularity
* Recommended WF
  + Depend on the agreement on propagation condition in issue 1-1-5. Go with option 1 if it is agreed to use fading channel, and TBD if it is agreed to use static channel.

**Issue 1-2-3: HARQ process number**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *HARQ process number*
    - *Option 1: 8*
    - *Other options are not precluded*
* Proposal
  + Option 1: 8 (Huawei)
* Recommended WF
  + Option 1.

### Sub-topic 1-3: TP to TR 38.883

**Issue 1-3-1: Section 7 Demod test challenge for DL 256QAM**

* Proposal
  + Option 1: Discuss how to capture demod test challenges for DL 256QAM for TR 38.883 (Ericsson)

• Recommended WF

* + Encourage companies to directly provide comments for E///’s TP in section 1.3.2.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Sub-topic 1-1: Main parameters** Issue 1-1-1: Tx EVM  Issue 1-1-2: Rx impairment modelling and band agnostic requirements  Issue 1-1-3: Rank  Issue 1-1-4: Channel bandwidth and PRB allocation  Issue 1-1-5: Propagation condition and MCS  Issue 1-1-6: MIMO configuration **Sub-topic 1-2: Other parameters** Issue 1-2-1: DM-RS configuration  Issue 1-2-2: PRB bundling size and Precoding model  Issue 1-2-3: HARQ process number  Others |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2007920  TP to TR 38.883: Section 7 Demod test challenges | 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#2** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

|  |  |
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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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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: SDR requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2006041 | China Telecom | The following observations and proposals were given for SDR requirements:  Observation 2: The spectral efficiency and required SNRs for 64QAM MCS 27 in MCS table 1 and 256QAM MCS 21 in MCS table 2 are very close.  Observation 3: For 256QAM MCS 26, the required SNR is much higher especially for 2 layers, but RAN4 already agreed not to put any limit on the upper SNR into the specification.  Proposal 10: Define FR2 SDR requirements for 256QAM:   * Add MCS indexes 26, 21, 20 and 11 in MCS table 2 for both 1 and 2 MIMO layers. * Run simulations to derive the required SNR at 85% throughput for MCS 20 to MCS 26 in MCS table 2, with both 1 layer and 2 layers. |
| R4-2006529 | Intel Corporation | Proposal 2: Do not define SDR requirements for FR2 256QAM. |
| R4-2007230 | Huawei, HiSilicon | Observation 3: For SDR test, after adding 0.5dB margin, only MCS20/21 is feasible, i.e. less than the maximum testable SNR 22.6dB for 50MHz bandwidth.  Observation 4: Very less applicable scenarios for 256QAM SDR test.  Proposal 3: Do not define SDR requirements for FR2 256QAM. |

## Open issues summary

### Sub-topic 2-1: SDR test parameters

**Issue 2-1-1: Whether to define SDR requirements for FR2 256QAM**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *FFS whether to define SDR requirements for FR2 256QAM*
* Proposal
  + Option 1: Define FR2 SDR requirements for 256QAM (CTC)
    - CTC: The spectral efficiency and required SNRs for 64QAM MCS 27 in MCS table 1 and 256QAM MCS 21 in MCS table 2 are very close. In Rel-15, FR2 SDR requirements have already been defined for 64QAM MCS 27 in MCS table 1. So, it is reasonable to define FR2 256QAM SDR requirements at least for MCS up to 21.
  + Option 2: Not to define FR2 SDR requirements for 256QAM (Intel, Huawei)
    - Huawei: For 50MHz bandwidth with rank 2 and other bandwidth greater than 50MHz, 256QAM will not be tested since the limitation of the TE maximum achievable SNR.
* Summary of companies’ simulation results for SDR test

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Rank** | **MCS** | **Ideal 85% SNR point (dB)** | | | **Impairment 85% SNR point (dB)** | | |
| **CTC** | **Intel** | **Huawei** | **CTC** | **Intel** | **Huawei** |
| 1 | 27 |  | 24.2 |  |  | 27.3 |  |
| 1 | 26 | 21.3 | 22.7 |  | 24.1 | 25.7 |  |
| 1 | 25 |  | 21.6 |  |  | 24.6 |  |
| 1 | 24 |  | 20.4 |  |  | 23.4 |  |
| 1 | 23 |  | 19.7 | 21.25 |  | 22.7 | 23.75 |
| 1 | 22 |  | 18.5 | 20.08 |  | 21.5 | 22.58 |
| 1 | 21 | 16.0 | 17.1 | 19.22 | 18.8 | 20.1 | 21.75 |
| 1 | 20 | 15.4 | 16.5 | 18.53 | 18.2 | 19.5 | 21.03 |
| 1 | 11 | 6.8 |  |  | 9.6 |  |  |
| 2 | 27 |  | 27.2 |  |  | 30.2 |  |
| 2 | 26 | 24.4 | 25.5 |  | 27.2 | 28.5 |  |
| 2 | 25 |  | 24.4 |  |  | 27.4 |  |
| 2 | 24 |  | 23.3 |  |  | 26.3 |  |
| 2 | 23 |  | 22.7 | 24.50 |  | 25.7 | 27.00 |
| 2 | 22 |  | 21.4 | 23.15 |  | 24.4 | 25.65 |
| 2 | 21 | 19.3 | 20.0 | 22.43 | 22.1 | 23.0 | 24.93 |
| 2 | 20 | 18.5 | 19.5 | 21.70 | 21.3 | 22.5 | 24.20 |
| 2 | 11 | 9.9 |  |  | 12.7 |  |  |

* Analysis on testable SNR for SDR requirements (Intel)
  + Recently, in our paper R4-1902881, we analysed the testable SNR for SDR requirements (i.e. testable SNR for Normal and SDR requirements is different due to generation of noise is not needed and more power can be used for generation of useful signal). In the following table, we provide estimations on testable SNR for different aggregation factors and different bands for DFF method.

Testable SNR for SDR requirements

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band** |  | **Aggregated channel bandwidth, [MHz]** | | | | | | | | |
|  | **50** | **100** | **200** | **400** | **500** | **600** | **700** | **800** | **1000** |
| **n257, 258, 261** | **TE SNR, [dB]** | 32.1 | 29.3 | 26.3 | 23.2 | 22.3 | 21.5 | 20.8 | 20.2 | 18.8 |
| **n260** | **TE SNR, [dB]** | 29.5 | 26.7 | 23.7 | 20.6 | 19.7 | 18.9 | 18.2 | 17.6 | 16.2 |

* Recommended WF
  + First align the understanding on the testable SNR for SDR requirements, e.g., is it feasible to consider Intel’s analysis as baseline?
  + Then discuss whether to define SDR requirements based on the simulation results from companies.

**Issue 2-1-2: MCS and rank for SDR test**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *If it is agreed to define SDR requirements, consider the following test parameters:*
    - *MCS and rank*
  + *Option 1: Add MCS indexes 26, 21, 20 and 11 in MCS table 2 for both 1 and 2 MIMO layers. Run simulations for these MCS indexes to derive the required SNR achieving 85% of peak throughput under AWGN conditions (CTC)*
  + *Other options are not precluded*
* Proposal
  + Updated Option 1 (slightly updated from the original option 1, changes are in red):
    - Add MCS indexes 26, 21, 20 and 11 in MCS table 2 for both 1 and 2 MIMO layers. Run simulations for ~~these MCS indexes~~ MCS 20 to MCS 26 in MCS table 2 to derive the required SNR achieving 85% of peak throughput under AWGN conditions. (China Telecom)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Sub-topic 2-1: SDR test parameters** Issue 2-1-1: Whether to define SDR requirements for FR2 256QAM  Issue 2-1-2: MCS and rank for SDR test |

## 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:* |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |
|  |  |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: CQI reporting requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2006041 | China Telecom | Proposal 11: Define FR2 CQI reporting requirements for CQI table 2.  Proposal 12: Cover higher SNR testing point compared to that in Rel-15 FR2 CQI tests.  Proposal 13: Cover both AWGN and fading conditions.  Proposal 14: For other parameters, reuse the assumptions in Rel-15 FR2 CQI tests. |

## Open issues summary

### Sub-topic 3-1: CQI test parameters

**Issue 3-1-1: Whether to define FR2 CQI reporting requirements for CQI table 2**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *FFS whether to define FR2 CQI reporting requirements for CQI table 2*
* Proposal
  + Option 1: yes (CTC)
    - CTC: There were concern raised about the testable SNR point, but we have not seen the issue considering the following:
      * In NR Rel-15 FR1 CQI tests with CQI table 2, the maximal SNR is only 15 dB or 13 dB.
      * In LTE 256QAM CQI test, the maximal SNR in AWGN and fading conditions is 21dB and 17 dB respectively.
* Recommended WF
  + TBA

**Issue 3-1-2: Propagation condition**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *If it is agreed to define FR2 CQI reporting, consider the following test parameters*
    - *Propagation condition*
    - *Option 1: Cover both AWGN and fading conditions*
    - *Other options are not precluded*
* Proposal
  + Option 1: Cover both AWGN and fading conditions (CTC)
    - CTC: Align with the FR1 CQI test in Rel-15.
* Recommended WF
  + TBA

**Issue 3-1-3: SNR testing point**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *If it is agreed to define FR2 CQI reporting, consider the following test parameters*
    - *SNR testing point*
    - *Option 1: Cover higher SNR testing point compared to that in Rel-15 FR2 CQI tests*
    - *Other options are not precluded*
* Proposal
  + Option 1: Cover higher SNR testing point compared to that in Rel-15 FR2 CQI tests (CTC)
    - CTC: if we reuse the SNR setup for NR Rel-15 FR1 CQI tests, the opportunity of reporting CQI indexes corresponding to 256QAM is quite small or none.
* Recommended WF
  + TBA

**Issue 3-1-4: Other parameters**

* *Agreement in RAN4 #94e-bis (R4-2005531, WF)*
  + *If it is agreed to define FR2 CQI reporting, consider the following test parameters*
    - *Other parameters*
    - *Option 1: Reuse the assumptions in Rel-15 FR2 CQI tests*
    - *Other options are not precluded*
* Proposal
  + Option 1: reuse the assumptions in Rel-15 FR2 CQI tests (CTC)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| XXX | **Sub-topic 3-1: CQI test parameters**  Issue 3-1-1: Whether to define FR2 CQI reporting requirements for CQI table 2  Issue 3-1-2: Propagation condition  Issue 3-1-3: SNR testing point  Issue 3-1-4: Other parameters |

## 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:* |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |