**3GPP TSG-RAN WG4 Meeting #96-e R4-200xxxx**

**Electronic Meeting, 17 - 28 Aug, 2020**

**Agenda item:** 7.10.3

**Source:** Moderator (China Telecom)

**Title:** Email discussion summary for [96e][321] NR\_DL256QAM\_FR2\_Demod

**Document for:** Information

# Introduction

This email thread discusses the demodulation and CSI reporting requirements for FR2 DL 256QAM in agenda 7.10.3.

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: Focus on the draft WF and the draft updated work plan.
* For the sub-thread on the draft WF, check if the tentative agreements in the 1st round summary are agreeable, and further make down-selection on candidate options:
* [96e][321] NR\_DL256QAM\_FR2\_Demod - draft WF R4-2012666 on UE demodulation and CSI reporting requirements for FR2 DL 256QAM (led by China Telecom)
* For the sub-thread on the draft updated WP, check if the updated CR work split and the simulation results collection work split is agreeable.
* [96e][321] NR\_DL256QAM\_FR2\_Demod - draft updated work plan R4-2012667 for FR2 DL 256QAM demodulation and CSI reporting requirements (led by China Telecom)

# Topic #1: PDSCH normal demodulation requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009584 | China Telecom | Proposal 1: Not model Rx impairment in the simulation.Proposal 2: Use rank 1 for FR2 PDSCH demodulation requirements.Proposal 3: Use TDLA30-300 fading channel for rank 1. |
| R4-2009728 | Intel Corporation | Proposal 1: Define FR2 256QAM demodulation requirements only for scenarios with Rank 1 and Static or TDL-D channel model. |
| R4-2010996 | 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: Fading channel with rank 2 is not feasible. Observation 3: For 100MHz CBW, only cases for AWGN/TDL-D30-35 with MCS 20 and rank 1 are feasible.Proposal 1: RAN4 should define the performance requirements for NR DL 256QAM for FR2 with the cases that satisfying the demand that required SNR is less than 22.6dB for 50MHz bandwidth and 19.4dB for 100MHz bandwidth respectively.Proposal 2: Define requirements for NR DL 256QAM for FR2 with the following parameters:

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| --- | --- |
| Parameters | Value |
| Rank | 1 |
| MCS | 20 |
| CBW | 50MHz |
| Propagation condition | TDL-C30-300 |
| Rx impairment | No explicit modelling |

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| R4-2011041 | NTT DOCOMO, INC. | Observation 1Table 1. Summary of ideal simulation results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rank | Channel Model | Antenna configuration | CBW (MHz)  | SNR point (dB) @70%TP Using MCS index: |
| 20 |
| 1 | TDLD30-35 | 2x2 | 50 | 16.5 dB |
| 2 | Static | 2x2 | 50 | 19.9 dB |

Observation 2: Considering around 3dB impairment margin, TDL-D 30-35 is testable under 50MHz CBW with full PRB allocation.Proposal 1: Consider following options for propagation condition for FR2 DL 256QAM* For Rank 1
* TDL-D (30-35 or 30-75) or TDL-A (30-300)
 |
| R4-2011374 | Ericsson | Observation 1: Under ideal simulations (without impairment), the 70% testing point is close to the SNR limit with OTA testing.Proposal 1: Do not create demodulation requirements using static channel model. |
| R4- 2011424 | Qualcomm Incorporated | Observation 1: Maximum testable SNR for FR2 band n260, 50MHz/120kHz under Mode 1 (used for fixed MCS, CQI reporting requirements) is 21.0 dB.Proposal 1: Define FR2 DL 256QAM fixed MCS requirements for TDLD30-75, MCS20, Rank1.Proposal 2: Do not define FR2 DL 256QAM fixed MCS requirements for Rank 2. |

## Open issues summary

### PDSCH normal test parameters

**Issue 1-0: Maximum testable SNR for PDSCH demodulation requirements (for information)**

* Summary of companies’ observations:
	+ Huawei: **22.6dB** for 50MHz bandwidth and 19.4dB for 100MHz bandwidth.
		- UE can’t assume which test method is used, therefore only the maximum SNR 19.4dB can be ensured which is the maximum SNR using DFF method. For channel bandwidth 50MHz, we calculate that the maximum testable SNR using DFF method is 22.6dB derived from spreadsheet in TS 38.810.
	+ Intel: **22.4dB** for 50MHz bandwidth and 19.4dB for 100MHz bandwidth.
		- For DFF method and CBW 100 MHz, maximum testable SNR is 19.4 dB. As 50 MHz CBW will be used for FR2 256QAM requirements, SNR 22.4 dB can be assumed as maximum testable for further analysis.
	+ Qualcomm: Maximum testable SNR for FR2 band n260, 50MHz/120kHz under Mode 1 (used for fixed MCS, CQI reporting requirements) is **21.0dB**.
		- Using the Demod SNR range calculator spreadsheet in 38.810, we computed the testable SNR for Mode1 (with Noc) as presented in below observation assuming multi-band relaxation factor of 1.7dB in Cell K5 as per maximum value in Table 6.2.1.3-4 in 38.101-2.
	+ CTC: 19.9dB for 100MHz bandwidth
		- According to the “Spreadsheet 2 - Demod SNR range calculator.xls” file attached to the TR 38.810, for indirect far field (IFF) method, at least the SNR of 19.9 dB is feasible for 100MHz channel bandwidth.

**Issue 1-1: Rx impairment modelling**

* *Agreement in RAN4 #95e (R4-2008817, WF)*
	+ *The following scenarios can be considered for band agnostic requirements definition; and FFS for other scenarios*
		- *Static channel mode: MCS 20-23, rank 1*
		- *TDL-D channel mode: MCS 20-21, rank 1*
		- *TDL-A channel mode: MCS 20-21, rank 1*
	+ *FFS on whether to explicitly model Rx impairment until the next meeting*
* Proposal on Rx impairment modelling
	+ Option 1: Not explicitly model Rx impairment (CTC, Huawei)
		- CTC: Aligned with Rel-15 FR2 demodulation tests.
		- Huawei: In Rel-15, there is no explicit phase noise modelling and all cases are band agnostic. Also, phase noise model in TR 38.803 is just an example. It is not suitable to use such example model when defining performance requirements.
* Recommended WF
	+ Not explicitly model Rx impairment.

**Issue 1-2: Rank**

* *Agreement in RAN4 #95e (R4-2008817, WF)*
	+ *Rank*
		- *Option 1: Rank 1*
		- *Option 2: Define requirements for Rank 1, FFS on whether to define requirements for rank 2*
		- *Option 3: Define requirements for single Rank configuration, i.e., either rank1 or rank 2*
* Proposal
	+ Option 1: Rank 1 only (CTC, Intel, Huawei, DCM, Qualcomm)
* Recommended WF
	+ Use rank 1 only.

**Issue 1-3: Propagation condition and MCS**

* *Agreement in RAN4 #95e (R4-2008817, WF)*
	+ *MCS*
		- *MCS 20 for rank 1, if requirements for rank 1 are to be defined.*
		- *FFS for rank 2*
	+ *Propagation condition*
		- *Option 1: Fading channel*
			* *Option 1A: TDLA30-300*
			* *Option 1B: TDLD30-75*
			* *Option 1C: TDLD30-35*
		- *Option 2: Static channel*
		- *TBD in the next meeting based on more companies’ simulation results*
* Proposals on MCS for rank1
	+ Option 1: MCS20 (Huawei, Qualcomm, agreement in the last meeting)
* Proposals on propagation condition for rank1
	+ Option 1: Fading channel (CTC, Huawei, DCM, Ericsson, Intel, Qualcomm)
		- Option 1A: TDLA30-300 (CTC, [Huawei], DCM)
		- Option 1B: TDLD30-75 (Intel, DCM, Qualcomm)
		- Option 1C: TDLD30-35 (Intel, DCM)
			* CTC: NLOS channel is more typical for demodulation tests. Note that LOS channel models including TDL-D and TDL-E have been not specified in TS 38.101-4 yet.
			* Huawei: Considering the extra workload for simplifying TDL-D channel model, we are OK to define [TDL-A] cases.
			* DCM: Considering that performance gain from DL 256QAM would be quite limited in NLOS condition, it is natural to assume LOS propagation model, i.e. TDL-D, for DL 256QAM. On the other hand, only for Rank 1, some performance gain would be considered even in NLOS condition.
			* Ericsson: We do not think testing demodulation requirements with static channel models should be considered. There are already defined REFSENS scenarios with static channel models in place.
			* Intel: we have sufficient margin only for scenarios with Rank 1 transmission and Static or TDL-D channel model.
	+ Option 2: Static channel (Intel)
* Summary of companies’ ideal simulation results for FR2 256QAM demodulation with 120kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rank | Channel Model | Antenna configuration | CBW (MHz)/PRB allocation (full/partial) | SNR point (dB) @70%TP (Ideal) |
| CTC | Intel | Huawei | DCM | Ericsson | QC |
| 1 | Static | 1x2 | 50/full |  | 16.1 | 15.92 |  | 15.3 | 17.30 |
| 1 | TDLD30-35 | 2x2 | 50/full |  | 17.9 | 16.70 | 16.5 |  | 17.85 |
| 1 | TDLD30-75 | 2x2 | 50/full |  |  |  |  |  | 17.84 |
| 1 | TDLA30-300 | 2x2 | 50/full |  | 18.9 | 17.94 |  | 17.3 | 19.54 |
| 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 | 18.94 | 19.9 |  | 20.59 |
| 2 | TDLD30-35 | 2x2 | 50/full |  | 23.9 |  |  |  |  |
| 2 | TDLA30-300 | 2x2 | 50/full |  | 29.5 |  |  |  |  |

* Recommended WF
	+ MCS for rank 1:
		- Keep the agreement in the last meeting, i.e., use MCS 20
	+ Propagation condition for rank 1:
		- Use fading channel, and further decide whether to use TDLA30-300 or TDLD30-75
			* Pros of using TDLA30-300: avoid extra workload for simplifying TDL-D channel model
			* Pros of using TDLD30-75: lower SNR is required

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Anritsu | **Topic #1: PDSCH normal demodulation requirements**Issue 1-1: Rx impairment modellingIssue 1-2: RankIssue 1-3: Propagation condition and MCSIssue 1-0: Maximum testable SNR for PDSCH demodulationIt is useful to clarify the basis of the Predicted FR2 SNR upper bound values in TR 38.810, for example in Table B.3.2.5.4-1 for Direct far field (DFF).  They were based on Rel-15 information available when TR 38.810 was written:a) n260 was the highest frequency/worst Refsens bandb) Multiband relaxation up to 1.7dB in Rx beam peak direction (2.0dB was allowed)c) Modulation order up to 64QAM was considered, and the backoff from the power amplifier 1dB compression point was estimated based on 6% EVM requirement for the downlink signal.For 256QAM demodulation requirements are based on 3% EVM, and the backoff from the power amplifier 1dB compression point is frequency dependent. Our estimate is that the current backoff allowance is sufficient to meet 3% EVM for bands n258, n261 and n257. For bands n260 and n259 a higher allowance would be needed.The proposed approach of using 50MHz channel bandwidth (32RBs) to increase the available SNR range seems good, and we note that according to R4-2006352 the maximum ΔMBP,n is 0.75 dB. Using the demodulation spreadsheet in TR 38.810 we estimate that under this scenario SNRs up to 22.0dB at baseband could be tested, which is compatible with the proposals in for example Intel R4-2009728, Huawei R4-2010996 and Qualcomm R4-2011424. As demodulation requirements are specified as band-agnostic, we suggest that this approach is used to define SNR requirements in 38.101-4, noting that at present there may be practical testing difficulties for bands such as n260 and n259. |
| docomo | **Topic #1: PDSCH normal demodulation requirements**Issue 1-1: Rx impairment modellingWe are OK with the recommended WF.Issue 1-2: RankWe are OK with the recommended WF.Issue 1-3: Propagation condition and MCSIf no testability issue is identified, we prefer TDLA30-300, since NLOS channel model is more typical for UE demodulation requirements than LOS propagation model. |
| Intel | **Issue 1-1: Rx impairment modelling** Ok with recommended WF.**Issue 1-2: Rank**Support recommended WF.**Issue 1-3: Propagation condition and MCS**We are fine with recommended WF. We also suggest to collect ideal and impairments results for different channel models to check expected SNR for requirements definition and pick scenario which meets SNR target 22 dB (based on Anritsu comment). Intel can volunteer to prepare the excel spreadsheet to results collection.  |
| Qualcomm | Issue 1-1/1-2: Ok with recommended WF.Issue 1-3: As of now, our preference is TDL-D because requirement for TDL-A based on our simulation results is very close to testable SNR limit of 22dB (after Anritsu’s clarification). |
| China Telecom | **Topic #1: PDSCH normal demodulation requirements**Issue 1-1: Rx impairment modellingAgree with the recommended WF.Issue 1-2: RankAgree with the recommended WF.Issue 1-3: Propagation condition and MCS* + MCS for rank 1:
* Agree with the recommended WF.
	+ Propagation condition for rank 1:
* Use fading channel, and prefer to use TDLA30-300 to avoid extra workload for simplifying TDL-D channel model.
 |
| Huawei | **Issue 1-1: Rx impairment modelling**OK with the recommended WF.**Issue 1-2: Rank**OK with the recommended WF.**Issue 1-3: Propagation condition and MCS**OK with the recommended WF. For propagation condition, prefer to use TDL-A30-300 considering NLOS is more typical and no extra work for TDL-A channel model simplification |
| Ericsson | **Issue 1-1, 1-2, 1-3:** Agree with recommended WF |

## 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** | * Issue 1-0: Maximum testable SNR for PDSCH demodulation requirements (for information)
	+ Huawei: **22.6dB** for 50MHz bandwidth and 19.4dB for 100MHz bandwidth.
	+ Intel: **22.4dB** for 50MHz bandwidth and 19.4dB for 100MHz bandwidth.
	+ Qualcomm: Maximum testable SNR for FR2 band n260, 50MHz/120kHz under Mode 1 (used for fixed MCS, CQI reporting requirements) is **21.0dB**.
	+ CTC: **19.9dB** for 100MHz bandwidth
	+ Anritsu: Note that according to R4-2006352 the maximum ΔMBP,n is 0.75 dB , using the demodulation spreadsheet in TR 38.810 we estimate that under this scenario SNRs up to **22.0dB** at baseband could be tested under 50MHz scenario.
* Issue 1-1: Rx impairment modelling

*Tentative agreements*: * + Not explicitly model Rx impairment (CTC, Huawei, DCM, Intel, QC, Ericsson)
* Issue 1-2: Rank

*Tentative agreements*: * + Rank 1 only (CTC, Intel, Huawei, DCM, Qualcomm, Ericsson)
* Issue 1-3: Propagation condition and MCS

*Tentative agreements*:* + MCS for rank 1:
		- Keep the agreement in the last meeting, i.e., use MCS 20 (Huawei, Qualcomm, Intel, CTC, Ericsson)
	+ Propagation condition for rank 1:
		- Use fading channel
		- In the next meeting, companies are encouraged to provide ideal and impairment results for both option 1A and option 1B, and down select one of the two options based on simulation results.
* Option 1A: TDLA30-300 (CTC, Huawei, DCM)
* Option 1B: TDLD30-75 (Intel, Qualcomm)
	+ Note: extra effort on TDLD channel model simplification is needed.
 |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on UE demodulation and CSI reporting requirements for FR2 DL 256QAM(Note: this WF covers topic #1/2/3) | China Telecom |
| #2 | Updated work plan for FR2 DL 256QAM demodulation and CSI reporting requirements(Note: update the work plan to add the CR work split and Simulation results collection work split) | China Telecom |

### 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 recommen728dation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round

### WF

**R4-2012666 WF on UE demodulation and CSI reporting requirements for FR2 DL 256QAM**

 *Type: other For: Approval
 Source: China Telecomm*

**Abstract:**

**Discussion:**

*Moderator’s note: The WF is discussed in sub-thread [96e][321] NR\_DL256QAM\_FR2\_Demod - draft WF R4-2012666 UE demodulation and CSI reporting requirements for FR2 DL 256QAM (led by China Telecom)*

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

* + Option 1: Define FR2 SDR requirements for 256QAM (CTC, DCM)
	+ Option 2: Not to define FR2 SDR requirements for 256QAM (Intel, Huawei, QC)
	+ Proposed WF: option 1

[CTC]: Firstly, based on companies’ analysis in the first round, the chance of using 256QAM in SDR test cannot be excluded. Secondly, since most companies have provided the impairment simulation results for 85% TP SNR points, the additional simulation workload is not much. Considering we have discussed this issue for 3 meetings’ time, we propose to define FR2 SDR requirements for 256QAM in this meeting.

[DCM]: We are OK with Proposed WF. Due to the testability issue, we understand that some UE can choose to test with 64QAM modulation instead of 256QAM modulation in SDR test. However, based on the table that CTC summarized in the 1st round, the chance of using 256QAM modulation cannot be excluded.

[Huawei, HiSilicon]: we prefer not to define SDR requirements for FR2 256QAM considering very less chance to verify 256QAM. If finally 256QAM requirements is defined, the test should not be applicable for the situation that MCS less than MCS20 is selected.

[CTC]: Response to Huawei: Is Huawei suggesting not to cover MCS index less than 20 in MCS Table2 in the SDR test? In draft\_v2 of the WF, we add option 2 in the MCS and rank issue in which MCS 11 in MCS Table2 is deleted. Please check if our understanding is correct.

[Intel]: The purpose of the DSR test is to verify that the Layer 1 and Layer 2 correctly process in a sustained manner the received packets corresponding to the maximum data rate indicated by UE capabilities. Based on our analysis 256QAM allows to increase testable date rate mainly for scenarios with Rank 1 transmission and rather small aggregated CBW. Taking into account that using of 256QAM for such scenarios will not increase testable data rate significantly and most of typical UEs will be tested for scenarios with higher aggregated CBW and 64QAM, we think that using of 64QAM is sufficient to meet SDR test purpose and definition of FR2 SDR requirements with 256QAM modulation is not required.

[Huawei, HiSilicon]: To CTC, our suggestion is that the case that 256QAM cannot be tested by the defined 256QAM requirements should be skipped, it means the test is not applicable when the finally selected MCS, i.e.  MCS = min(MCS1,MCS2) in TS 38.101 is less than 20.

[CTC]: To Huawei: For clarification, we are not intending to introduce a new test case in addition to the existing FR2 SDR test case. Instead, we are just proposing to add MCS indexes for 256QAM to the existing requirements, which is aligned with the FR1 SDR test design. To be clearer, we changed the proposal from “Define FR2 SDR requirements for 256QAM” to “Add 256QAM (modulation format of 8) to FR2 SDR requirements”.

To All: Our view is that with FR2 256QAM feature introduced in Rel-16, UE can report the support of modulation format 8, so it is natural to add those MCS indexes to the SDR requirements accordingly. But given the different views here, we are fine to keep this open, and let us come back in the next meeting

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

* + Proposed WF: In the next meeting, decide whether to introduce the requirements for AWGN and/or fading conditions based on the simulation results under 50MHz CBW:
	+ For AWGN condition, companies are encouraged to simulate the required SNR for achieving median CQI of 11 in CQI table 2.
	+ For fading condition, companies are encouraged to simulate the required SNR where CQI indices corresponding to 256QAM (i.e., 12 and higher) ~~where CQI 12~~ in CQI table 2 can be reported with at least [10%] probability
	+ If it is agreed to define FR2 CQI reporting test for CQI table 2, use channel bandwidth of 50MHz.

[CTC]: As mentioned in the 1st round summary, we would like to check if the above proposal is agreeable. The intention is to encourage more simulation results based on the same criteria, and then we can make decision in the next meeting. Note that there is minor wording update compared to the proposal in the 1st round summary (coloured in blue).

[Huawei, HiSilicon]: One typo should be corrected: For AWGN, it should be CQI 12 (the smallest CQI index for 256QAM) instead of CQI#11 to ensure there is chance to report 256QAM.

[CTC]: Response to Huawei: Yes, CQI 12 is the smallest CQI index for 256QAM. The reason we propose CQI index of 11 but not 12 is that: As per the FR2 CQI reporting test procedure under AWGN condition in TS38.101-4, ‘*the BLER using the transport format indicated by the (median CQI + 1)*’will be tested. Therefore, we think it is sufficient to cover 256QAM when medium CQI of 11 is achieved.

[Huawei, HiSilicon]:  To CTC, whether median CQI+1 or media CQI-1 should be tested, it depends on if the BLER of median CQI is less than or equal to 0.1. if we choose median CQI #11 with BLER larger than 0.1, then median CQI-1, i.e. CQI#10 should be tested, but it is not 256QAM. Actually the best way is to choose media CQI#13, then median CQI+1 or median CQI-1 is within 256QAM.

[CTC]: In the v3 version draft WF, we modified the simulation assumption to ‘the required SNR for achieving medium CQI of [11, 12 and 13]’. We can further discuss which value can be used based on the simulation results.

•      Issue 3-2: Test applicability for FR2 256QAM CQI Test

* + Proposed WF: If it is agreed to define FR2 CQI reporting for CQI table 2, consider the following test applicability:
	+ If UE passes the test with CQI Table 2, then it can skip the corresponding test with CQI Table 1 (CTC, QC, Huawei)
	+ Note: Similar to the existing CQI table 1 test, the test for CQI Table 2 will cover both lower SNR and higher SNR.

[CTC] Based on the 1st round discussion, generally this applicability seems agreeable, and we updated the wording based on the 1st round comments.

[QC]: On slide 7, for MCS and Rank, can you please add “other options are not precluded” because we have concerns whether we can use the same upper bound as FR1 because we will also have to consider the impact of phase noise in high SNR regime. On slide 9, can you please add “other options are not precluded” for SNR points. It can be decided in next meeting based on simulation results.

**Recommendation: Agreeable.**

### Updated WP

**R4-2012667 Updated work plan for FR2 DL 256QAM demodulation and CSI reporting requirements**

 *Type: Work plan For: Approval
 Source: China Telecomm*

**Abstract:**

**Discussion:**

*Moderator’s note: The updated WP is discussed in sub-thread [96e][321] NR\_DL256QAM\_FR2\_Demod - draft updated work plan R4-2012667 for FR2 DL 256QAM demodulation and CSI reporting requirements (led by China Telecom).*

[CTC]: Note that Intel volunteer to collect the simulation results for PDSCH normal demodulation according to the first round discussion, and China Telecom volunteers to take the CR for the requirements of CQI reporting, and the simulation result collection for CQI reporting requirements.

[ZTE]: ZTE can take care of the requirements for PDSCH normal demodulation.

[HW]: Huawei’s preference is added.

[CTC]: The CR responsibility for SDR requirements applicability and CQI reporting FRC & applicability are remained ‘TBD’.

**Recommendation: Agreeable .**

## Summary on 2nd round

*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”* |
| R4-2012666,WF | *Agreeable.* |
| R4-2012667, Updated WP | *Agreeable.* |

# Topic #2: SDR requirements

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009584 | China Telecom | Observation 1: The chance for using 256QAM in FR2 SDR test does exist, it is not reasonable to prevent introducing FR2 SDR tests due to the testability issue.Proposal 4: 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.
 |
| R4-2009729 | Intel Corporation | Proposal 1: Do not define SDR requirements for FR2 256QAM. |
| R4-2010997 | Huawei, HiSilicon | Observation 1: Considering extra 0.8dB margin,* For maximum supporting MIMO layer 1, MCS 26 can be test only for the bandwidth less than 200MHz, MCS 20 can be test for the bandwidth less than 500MHz.
* For maximum supporting MIMO layer 2, MCS 26 can be test only for the bandwidth of 50MHz, MCS 20 can be test for the bandwidth less than 200MHz.

Proposal 1: Do not define SDR requirements for FR2 256QAM for Rel-16. |
| R4-2011042 | NTT DOCOMO, INC. | Proposal 1: Define FR2 256QAM SDR requirements both for rank 1 and rank 2 |
| R4- 2011425 | Qualcomm Incorporated | Observation 1: Maximum testable SNRs for FR2 band n260 under Mode 2 (used for SDR requirements) are given in Table 1.Proposal 1: Define SDR requirements for FR2 256QAM. |

## Open issues summary

### SDR test parameters

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

* *Agreement in RAN4 #95e (R4-2008817, WF)*
	+ *In the next meeting, decide whether to define SDR requirements for FR2 256QAM, based on more simulation results and analysis for testable SNR*
* Proposal
	+ Option 1: Define FR2 SDR requirements for 256QAM (CTC, DCM, QC)
		- CTC: The chance for using 256QAM in FR2 SDR test does exist, it is not reasonable to prevent introducing FR2 SDR tests due to the testability issue.
		- DCM: From operator perspective, we consider that DL rank 2 transmission is one of typical configurations even for FR2. It is important to ensure the UE functionality of FR2 256QAM with Rank 2 as Rank 1.
		- QC: Based on preliminary simulation results, we can get to higher throughput than 64QAM for some cases.
	+ Option 2: Not to define FR2 SDR requirements for 256QAM (Intel, Huawei)
		- Intel: 1) 256QAM MCS and Rank 2 can be tested for channel bandwidth up to 400 MHz for bands n257, n258, n261 and up to 200 MHz for band n260. 2) rather high MCSs (i.e. MCS 24-27) can be tested mainly for 50 and 100 MHz aggregated channel bandwidth.
		- Huawei: 1) For maximum supporting MIMO layer 1, MCS 26 can be test only for the bandwidth less than 200MHz, MCS 20 can be test for the bandwidth less than 500MHz. 2) For maximum supporting MIMO layer 2, MCS 26 can be test only for the bandwidth of 50MHz, MCS 20 can be test for the bandwidth less than 200MHz.
* Summary of companies’ simulation results for SDR test

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **MCS** | **Ideal 85% SNR point (dB)** | **Impairment 85% SNR point (dB)** |
| **CTC** | **Intel** | **Huawei** | **QC** | **CTC** | **Intel** | **Huawei** | **QC** |
| 1 | 27 |  | 24.2 |  |  |  | 27.2 |  |  |
| 1 | 26 | 21.3 | 22.7 | 21.56 |  | 24.1 | 25.7 | 24.06 |  |
| 1 | 25 |  | 21.6 | 20.70 | 25.71 |  | 24.6 | 23.20 | 28.51 |
| 1 | 24 |  | 20.4 | 19.73 | 23.30 |  | 23.4 | 22.23 | 26.1 |
| 1 | 23 |  | 19.7 | 18.61 | 21.50 |  | 22.7 | 21.01 | 24.3 |
| 1 | 22 |  | 18.5 | 17.21 | 19.82 |  | 21.5 | 19.71 | 22.62 |
| 1 | 21 | 16.0 | 17.1 | 16.55 | 18.28 | 18.8 | 20.1 | 19.05 | 21.08 |
| 1 | 20 | 15.4 | 16.5 | 15.78 | 17.56 | 18.2 | 19.5 | 18.28 | 20.36 |
| 1 | 11 | 6.8 |  |  |  | 9.6 |  |  |  |
| 2 | 27 |  | 27.2 |  |  |  | 30.2 |  |  |
| 2 | 26 | 24.4 | 25.7 | 24.60 |  | 27.2 | 28.5 | 27.10 |  |
| 2 | 25 |  | 24.6 | 23.51 |  |  | 27.4 | 26.01 |  |
| 2 | 24 |  | 23.4 | 22.66 |  |  | 26.3 | 25.16 |  |
| 2 | 23 |  | 22.7 | 21.48 |  |  | 25.7 | 23.98 |  |
| 2 | 22 |  | 21.5 | 20.13 | 23.23 |  | 24.4 | 22.63 | 26.03 |
| 2 | 21 | 19.3 | 20.1 | 19.39 | 21.64 | 22.1 | 23.0 | 21.89 | 24.44 |
| 2 | 20 | 18.5 | 19.5 | 18.65 | 20.75 | 21.3 | 22.5 | 21.15 | 23.55 |
| 2 | 11 | 9.9 |  |  |  | 12.7 |  |  |  |

* Analysis on testable SNR for SDR requirements:
	+ Huawei: The maximum testable SNR can be derived as per the following equations referenced from TS 38.810.

|  |
| --- |
| SNRmax = Ps,max / Pnoise,ΣPnoise,Σ = NnoiseRF \* BWPtotal,max = Ps,maxSNRmax = Ptotal,max / (NnoiseRF \* BW) |

|  |  |
| --- | --- |
| Channel Bandwidth/MHz | Maximum SNR/dB |
| DNF | DFF | IFF |
| 50 | 32.75 | 29.55 | 29.85 |
| 100 | 29.87 | 26.67 | 26.97 |
| 200 | 26.86 | 23.66 | 23.96 |
| 400 | 23.85 | 20.65 | 20.95 |
| 500 | 22.88 | 19.68 | 19.98 |
| 600 | 22.09 | 18.89 | 19.19 |
| 700 | 21.42 | 18.22 | 18.52 |
| 800 | 20.84 | 17.64 | 17.94 |
| 900 | 19.83 | 16.63 | 16.93 |
| 1000 | 19.37 | 16.17 | 16.47 |

* + Intel: Testable SNR for Normal and SDR requirements is different because generation of noise is not needed for SDR and more power can be used for generation of useful signal.

|  |  |  |
| --- | --- | --- |
| **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 |
| **Feasible MCS (Rank 1)** | MCS27 | MCS27 | MCS26 | MCS23 | MCS22 | MCS22 | MCS21 | MCS21 | N/A |
| **Feasible MCS (Rank 2)** | MCS27 | MCS26 | MCS23 | MCS21 | N/A | N/A | N/A | N/A | N/A |
| **n260** | **TE SNR, [dB]** | 29.5 | 26.7 | 23.7 | 20.6 | 19.7 | 18.9 | 18.2 | 17.6 | 16.2 |
| **Feasible MCS (Rank 1)** | MCS27 | MCS26 | MCS22 | MCS21 | MCS20 | N/A | N/A | N/A | N/A |
| **Feasible MCS (Rank 2)** | MCS26 | MCS23 | MCS21 | N/A | N/A | N/A | N/A | N/A | N/A |

* + Qualcomm: Using the Demod SNR range calculator spreadsheet in 38.810, the testable SNR for SDR scenario (Mode 2) is presented assuming multi-band relaxation factor of 1.7dB in Cell K5 as per maximum value in Table 6.2.1.3-4 in 38.101-2. For deriving testable SNR for SDR requirements, we set Cell M11 in the spreadsheet to 20dB and vary the number of RBs in Cell K28 based on CBW.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CBW (MHz) | 50 | 100 | 200 | 400 | 800 | 1200 |
| Number of RBs | 32 | 66 | 132 | 264 | 528 | 792 |
| Max Testable SNR in dB | 28.1 | 25.0 | 22.0 | 18.9 | 15.9 | 14.2 |

* **Moderator’s observation**
	+ It is common understanding that the testable SNR is higher for SDR test compared to normal test, although there are different views on the exact testable SNR numbers.
	+ The chance for using 256QAM in FR2 SDR test does exist. The question is how large the opportunity of using 256QAM is and whether it worth to define the tests.
* Recommended WF
	+ Since we agreed to decide whether to define SDR requirements for FR2 256QAM in this meeting, encourage further discussion.

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

* *Agreement in RAN4 #95e (R4-2008817, 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 MCS 20 to MCS 26 in MCS table 2 to derive the required SNR achieving 85% of peak throughput under AWGN conditions.*
	+ *Other options are not precluded.*
* Proposal
	+ Option 1 (CTC)
		- 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.
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| docomo | **Topic #2: SDR requirements** Issue 2-1: Whether to define SDR requirements for FR2 256QAMWe prefer to intoroduce SDR requiremenst for FR2 256QAM. From our perspective, we consider that 256QAM rank1 and rank 2 transmission are one of typical configurations even for FR2. RAN4 has agreed not to put any limit on the upper SNR into the specification. In this sense, the introduction of SDR requirements and the testability issue should basically be discussed separately.Issue 2-2: MCS and rank for SDR testWe are generally OK with Option1. |
| Intel | **Issue 2-1: Whether to define SDR requirements for FR2 256QAM**We think that we need to ensure that defined requirements can be tested using existing test procedure. Therefore. we propose not to define SDR requirements, because, based on our analysis, 256QAM can operate in testable SNR region only for limited CA scenarios (especially for band n260, same observation can be made for band n259). In case we consider existing procedure for FR2 SDR testing, CA CBW combinations with the highest data rate will be selected for testing. Based on our understanding, scenario with higher aggregated CBW and 64QAM modulation usually will be selected for testing instead of scenario with lower aggregated CBW and 256QAM modulation. For example, UE supports CA\_n257I (400 MHz) and CA\_n257J (500 MHz) with Rank 2, maximum testable data rate for CA\_n257I is around 3410 Mbps (SCS 120, MCS 21) and for CA\_n257J is around 3850 Mbps (SCS 120, MCS 19). Therefore, CA\_n257J with MCS19 (64QAM) will be selected for testing. |
| Qualcomm | Issue 2-1: We agree with moderator’s observations. Based on testable SNR limits, it seems that any UE which supports larger than 200MHz CBW may not be tested under 256QAM. So, there is very little opportunity to test SDR since FR2 CA bandwidth can go up to 1200MHz. So, we slightly prefer not to do this work for such little gain and prefer not to define SDR requirements.Issue 2-2: Compared to FR1, SNR required in high MCS regime for FR2 will be impacted by both phase noise and Tx EVM. So, we prefer to set the max MCS based on simulation results such that the SNR required does not go beyond Tx EVM limits, similar to what we did in FR1. |
| China Telecom | **Topic #2: SDR requirements** Issue 2-1: Whether to define SDR requirements for FR2 256QAMBased on companies’ evaluation of testable SNR points and simulation results, the largest channel bandwidth which can be covered by 256QAM (MCS 20) is summarized as below:

|  |  |  |
| --- | --- | --- |
| Company | Rank 1 | Rank 2 |
| Huawei | 500MHz | 200MHz |
| Intel (n257, 258, 261) | 800MHz | 400MHz |
| Intel (n260) | 500MHz | 200MHz |
| Qualcomm | 200MHz | 100MHz |

We understand that in some cases, to achieve maximum TP, UE is likely to choose larger channel bandwidth rather than higher MCS indexes. However, based on the above summary, the chance of using 256QAM does exist.Therefore, we still suggest to define SDR requirements for FR2 256QAM |
| Huawei | Issue 2-1: Whether to define SDR requirements for FR2 256QAMConsidering very limited applicable scenarios for 256QAM for SDR test, we prefer not to define SDR requirements for FR2 256QAM. If finally 256QAM requirements is defined, the test should not be applicable for the situation that MCS less than MCS20 is selected. |

## 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#2** | * Issue 2-1: Whether to define SDR requirements for FR2 256QAM
	+ Option 1: Define FR2 SDR requirements for 256QAM (CTC, DCM)
	+ Option 2: Not to define FR2 SDR requirements for 256QAM (Intel, Huawei, QC)

*Recommendations for 2nd round:** + Encourage further discussion in the second round.
* Issue 2-2: MCS and rank for SDR test
	+ Option 1 (CTC, DCM)
		- 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.

*Recommendations for 2nd round:** + Decide after the decision on issue 2-1
 |

*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

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009584 | China Telecom | Proposal 5: Define FR2 CQI reporting test using CQI Table 2.Proposal 6: For the test applicability for UE supporting FR2 256QAM , the corresponding Rel-15 FR2 CQI test using CQI Table 1 can be replaced by the new defined CQI Table 2 test.Proposal 7: Cover both AWGN and fading conditions.Observation 2: In AGWN condition, when the SNR is 18dB or lower, the chance of reporting CQI corresponding to 256QAM (i.e., CQI index > 11) is nearly none.Proposal 8: To cover CQI reporting corresponding to 256QAM, configure higher SNR test points, i.e., 19/20 dB for AWGN condition and 17/18 dB for fading condition in FR2 CQI table 2 test.Proposal 9: Use channel bandwidth of 50MHz for both AWGN and fading conditions to have higher achievable SNR.Proposal 10: The other test parameters defined for Rel-15 CQI Table 1 test can be reused. |
| R4-2010998 | 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.Proposal 1: RAN4 should define the performance requirements for NR DL 256QAM for FR2 with the cases that satisfying the demand that required SNR is less than 22.6dB for 50MHz bandwidth and 19.4dB for 100MHz bandwidth respectively.Proposal 2: Do not define CQI reporting requirements under AWGN channel. |
| R4- 2011433 | Qualcomm Incorporated | Observation 1: Maximum testable SNR for FR2 band n260, 50MHz/120kHz under Mode 1 (used for fixed MCS, CQI reporting requirements) is 21.0 dB.Observation 2: It is not possible to reach 256QAM CQI under fading condition due to the testable SNR limit for FR2.Proposal 1: Do not define FR2 256QAM fading CQI reporting requirements. |

## Open issues summary

### CQI test parameters

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

* *Agreement in RAN4 #95e (R4-2008817, WF)*
	+ *In the next meeting, decide whether to define FR2 CQI reporting requirements for CQI table 2*
* Proposal
	+ For AWGN condition:
		- Option 1: Yes (CTC)
		- CTC: Based on our simulation results, when the SNR is 19dB and 20dB, the chance of reporting CQI corresponding to 256QAM (i.e., CQI index > 11) is 49% and 99% respectively.
		- Option 2: No (Huawei)
		- Huawei: For AWGN case, Median CQI 11 is expected at SNR 22dB (add 3dB margin), of which the modulation order is 64QAM.
	+ For fading condition:
		- Option 1: Yes (CTC)
		- CTC: Under fading condition, it is expected that lower SNR will be needed for UE to report CQI corresponding to 256QAM with certain opportunity.
		- Option 2: No (QC)
		- Qualcomm: The alignment required SNR to achieve 90% of peak throughput for fixed MCS21 (minimum 256QAM CQI) is 22.52dB under TDLA30-35 and 19.44dB under TDLD30-35. It is not possible to reach 256QAM CQI under fading condition due to the testable SNR limit for FR2.
* Recommended WF
	+ TBA whether to define FR2 CQI reporting requirements for CQI table 2
	+ If it is agreed to define FR2 CQI reporting requirements for CQI table 2, use channel bandwidth of 50MHz.

**Issue 3-2: Test applicability for FR2 256QAM CQI Test**

* Proposal
	+ Option 1: Replace the corresponding Rel-15 FR2 CQI test using CQI Table 1 by the new defined CQI Table 2 test. (CTC)
* Recommended WF
	+ Encourage feedback from more companies.

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

* *Agreement in RAN4 #95e (R4-2008817, 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
	+ For AWGN condition:
		- Option 1: 19/20 dB (CTC)
		- CTC: In AGWN condition, when the SNR is 18dB or lower, the chance of reporting CQI corresponding to 256QAM (i.e., CQI index > 11) is nearly none.
	+ For fading condition:
		- Option 1: 17/18 dB (CTC)
* Recommended WF
	+ Encourage feedback from more companies.

**Issue 3-4: Other parameters**

* *Agreement in RAN4 #95e (R4-2008817, 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

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Company A | **Topic #3: CQI reporting requirements**Issue 3-1: Whether to define FR2 CQI reporting requirements for CQI table 2Issue 3-2: Test applicability for FR2 256QAM CQI TestIssue 3-3: SNR testing pointIssue 3-4: Other parameters |
| Qualcomm | **Topic #3: CQI reporting requirements**Issue 3-1: Whether to define FR2 CQI reporting requirements for CQI table 2Ok with recommended WF.Issue 3-2: Test applicability for FR2 256QAM CQI TestI assume that “replace” means if UE passes the test with MCS Table 2, then it can skip the test with MCS Table 1. If that is the case, we are ok with Option 1, if it is agreed to define the CQI reporting test with MCS Table 2.Issue 3-3: SNR testing pointPrefer to decide this after the decision on Issue 3-1.Issue 3-4: Other parametersOk with Option 1. |
| China Telecom | **Topic #3: CQI reporting requirements**Issue 3-1: Whether to define FR2 CQI reporting requirements for CQI table 2Based on our simulation results, in AWGN channel, when the SNR is not smaller than 19dB, the chance of reporting CQI corresponding to 256QAM is high, which is aligned with the simulation results provided by Huawei. Furthermore, under fading condition, it is expected that lower SNR will be needed for UE to report CQI corresponding to 256QAM with certain opportunity.If we agree to use 50MHz CBW, CQI indices corresponding 256QAM can be reported under testable SNR. So, we support to define FR2 CQI reporting requirements for CQI table 2 under both AWGN and fading conditions, and use channel bandwidth of 50MHz.Issue 3-2: Test applicability for FR2 256QAM CQI TestWe support option 1, which means the number of test cases is not increased.Issue 3-3: SNR testing pointWe propose 19/20 dB for AWGN condition and 17/18 dB for fading condition.Issue 3-4: Other parametersWe propose to reuse the assumptions in Rel-15 FR2 CQI tests |
| Huawei | **Topic #3: CQI reporting requirements**Issue 3-1: Whether to define FR2 CQI reporting requirements for CQI table 2For AWGN cases, based on simulation, it can be observed that MCS 12 which is the lowest MCS for 256QAM is reported at 20dB SNR. for our understanding, the simulation results is ideal results. Considering about 3dB impairment, 256QAM cannot be reported at the 20dB SNR in the practical test. Therefore, the current test setup is not feasible if the test purpose is to test 256QAM..Issue 3-2: Test applicability for FR2 256QAM CQI TestWe are OK with Option 1, i.e. Rel-15 CQI reporting test is not applicable for UE if the Rel-16 CQI reporting requirement is defined. @CTC: We notice that there are two test cases with 8/9, 14/15 dB SNR for AWGN cases and two test cases with 6/7, 12/13 dB SNR for fading cases. We are wondering if you means which case or both are to be replaced?Issue 3-3: SNR testing pointThe SNR need to further discuss after Issue 3-1 is solved.Issue 3-4: Other parametersOK with the recommended WF. |

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

*Recommendations for 2nd round:** + Further check in the 2nd round if the following proposal is agreeable
		- In the next meeting, decide whether to introduce the requirements for AWGN and/or fading conditions based on the simulation results under 50MHz CBW:
* For AWGN condition, companies are encouraged to simulate the required SNR for achieving median CQI of 11 in CQI table 2.
* For fading condition, companies are encouraged to simulate the required SNR where CQI 12 in CQI table 2 can be reported with at least [10%] probability.
	+ - If it is agreed to define FR2 CQI reporting test for CQI table 2, use channel bandwidth of 50MHz.
* Issue 3-2: Test applicability for FR2 256QAM CQI Test

*Recommendations for 2nd round:** + Further check in the 2nd round if the following proposal is agreeable (updated the wording from the original option 1)
		- If it is agreed to define the CQI reporting test with CQI Table 2, apply the following test applicability:
* If UE passes the test with CQI Table 2, then it can skip the corresponding test with CQI Table 1 (CTC, QC, Huawei)
* Note: Similar to the existing CQI table 1 test, the test for CQI Table 2 will cover both lower SNR and higher SNR.
* Issue 3-3: SNR testing point for the higher SNR
	+ For AWGN condition:
		- Option 1: 19/20 dB (CTC)
	+ For fading condition:
		- Option 1: 17/18 dB (CTC)

*Tentative agreements*:* + Decide in the next meeting based on more simulation results.
* Issue 3-4: Other parameters

*Tentative agreement:** + If it is agreed to define the CQI reporting test with CQI Table 2, reuse the other parameters in Rel-15 FR2 CQI tests
 |

*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*

|  |  |
| --- | --- |
| **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”* |