**3GPP TSG-RAN WG4 Meeting # 104-bis-e R4-22XXXXX**

**Electronic Meeting, 10 – 19 Oct 2022**

**Agenda item:** 6.7.4

**Source:** Xiaomi

**Title:** Email discussion summary for [104-bis-e][131] FR2\_enh\_req\_Ph3\_part2

**Document for:** Information

# Introduction

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

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

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

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
|  |  |  |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: TP and update TR

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2216349**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216349.zip) | Xiaomi | This contribution provides a TP on link level simulation assumptions for FR2 UL 256QAM based on the agreement in RAN4 #104-e meeting. |
| R4-2216348 | Xiaomi,Nokia | Update TR to capture the approved TP |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1

*Sub-topic description:*

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

**Issue 1-1: Approved TP in R4-2216349**

* Proposals
	+ Option 1: Yes
	+ Option 2: Modification is needed
* Recommended WF
	+ TBA

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Option 2Thank you very much for the TP. We would like to include a clarification sentence like ‘The listed simulation assumptions do not reflect side conditions for setting the UE RF requirement for UL 256QAM’ |

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic #1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

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

## Discussion on 2nd round (if applicable)

# Topic #2: UL 256QAM

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215577**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215577.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: For the simulation results at 29 GHz (n257):****- If MCS index is 21, 256QAM goes over 64QAM in around 24-25 dB for all simulated EVMs.****- If MCS index is 23, 256QAM goes over 64QAM in around 28 dB for (transmit and receive) EVM of 3%, around 32 dB for (transmit and receive) EVM of 3.5%, and loses for (transmit and receive) EVM of 4%.****Observation 2: For the simulation results at 39 GHz (n260):****- Only with (transmit and receive) EVM of 0%, MCS21 for 256QAM seems to win 64QAM in around 36 dB.** |
| [**R4-2215578**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215578.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: To consider ICI compensation only if sufficient performance improvement is shown by proponent with explanation of the underlying algorithm.****Proposal 2: To adopt option 2 to use a fixed PTRS configuration for all devices for the EVM test.****Proposal 3: To use the findings recorded in TR 38.803 on phase noise for mm-wave frequencies as a basis for the phase noise assumption on the EVM budget.****Proposal 4: To use EVM of 3.5% (current EVM requirements in FR1 for 256QAM) and operating SNR of 32 dB as a basis at 29 GHz (n257).** |
| [**R4-2215920**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215920.zip) | LG Electronics France | ***Observation1***: In 29 GHz & TDL-A,* There is the performance gain in MCS21 when EVM ≥ 3.0%
* There is no performance gain in MCS23

***Observation2***: In 29 GHz & TDL-D* There is the perfornace gain when EVM = 3.5%

***Observation3***: In 29 GHz & AWGN* There is the perfornace gain at a relatively low SNR when EVM = 3.5%.

***Observation4:*** In 48 GHz, * There is no performance gain in most cases

Based on the observations, we propose as follows.***proposal 1:*** UL 256QAM is feasible for 29GHz with 3.5% EVM except for high coding rate case.***proposal 2:*** Further study is needed for 48GHz. |
| [**R4-2216128**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216128.zip) | vivo | **Observation 1：**The UL 256 QAM under 29 GHz can achieve performance gain at:

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx\_EVM = Rx\_EVM =3%** | **TDL-A** | **TDL-D** | **AWGN** |
| 50 MHz | 100MHz | 50 MHz | 100MHz | 50 MHz | 100MHz |
| **DFT-s-OFDM** | 22.0 dB | 22.8 dB | 20 dB | 21 dB | 18 dB | 19.2 dB |
| **CP-OFDM** | 22.5 dB | 23.8 dB | 20.3 dB | 21.5 dB | 19.2 dB | 19.7 dB |

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx\_EVM = Rx\_EVM =3.5%** | **TDL-A** | **TDL-D** | **AWGN** |
| 50 MHz | 100MHz | 50 MHz | 100MHz | 50 MHz | 100MHz |
| **DFT-s-OFDM** | 22.2 dB | 23.1 dB | 20.3 dB | 21.2 dB | 18.5 dB | 19.5 dB |
| **CP-OFDM** | 22.7 dB | 24 dB | 20.8 dB | 21.8 dB | 19.5 dB | 19.7 dB |

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx\_EVM = Rx\_EVM =4%** | **TDL-A** | **TDL-D** | **AWGN** |
| 50 MHz | 100MHz | 50 MHz | 100MHz | 50 MHz | 100MHz |
| **DFT-s-OFDM** | 22.9 dB | 23.5 dB | 20.6 dB | 21.5 dB | 19.2 dB | 19.7 dB |
| **CP-OFDM** | 23.2 dB | 24.7 dB | 21.2 dB | 22 dB | 19.8 dB | 19.9 dB |

**Observation 2：The UL 256 QAM under 39 GHz can achieve performance gain at:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx\_EVM = Rx\_EVM =3%** | **TDL-A** | **TDL-D** | **AWGN** |
| 50 MHz | 100MHz | 50 MHz | 100MHz | 50 MHz | 100MHz |
| **DFT-s-OFDM** | 24 dB | 27 dB | 22.3 dB | 25.8 dB | 19.9 dB | 22 dB |
| **CP-OFDM** | 28 dB | N/A | 24 dB | N.A. | 21.5 dB | 26 dB |

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx\_EVM = Rx\_EVM =3.5%** | **TDL-A** | **TDL-D** | **AWGN** |
| 50 MHz | 100MHz | 50 MHz | 100MHz | 50 MHz | 100MHz |
| **DFT-s-OFDM** | 24.4 dB | 27.5 dB | 23 dB | 26 dB | 20 dB | 23 dB |
| **CP-OFDM** | 29.2 dB | N/A | 25 dB | N.A. | 21.8 dB | 28 dB |

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx\_EVM = Rx\_EVM =4%** | **TDL-A** | **TDL-D** | **AWGN** |
| 50 MHz | 100MHz | 50 MHz | 100MHz | 50 MHz | 100MHz |
| **DFT-s-OFDM** | 24.8 dB | 28.2 dB | 23.3 dB | 28 dB | 20.3 dB | 23 dB |
| **CP-OFDM** | 34 dB | N/A | 25.8 dB | N.A. | 22 dB | 30 dB |

**Observation 3：**The UL 256 QAM is hard to bring performance gain under 48 GHz**Observation 4:** The system level simulation is needed to show whether the UE can achieve target SNR at BS side. **Proposal:** Taking the following system level simulation assumption as starting point for further evaluation:**Table I system level simulation assumptions**

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Urban macro** | **Indoor** |
| Network layout | hexagonal grid, 19 macro sites, 3 sectors per site with wrap around | 50m x 120m, 12BSs |
| Inter-site distance | 200m (baseline)300m (optional) | 20m |
| BS antenna height | 25 m | 3 m |
| UE location | Outdoor/indoor | Outdoor and indoor | Indoor |
| Indoor UE ratio | 20% |  |
| Low/high Penetration loss ratio | 50% low loss, 50% high loss |  |
| LOS/NLOS | LOS and NLOS | LOS and NLOS |
| UE antenna height | Same as 3D-UMa in TR 36.873 | 1 m |
| UE distribution (horizontal) | Uniform |
| Minimum BS - UE distance (2D) | 35 m | 0 m |
| Shadowing correlation | Between cells: 1.0Between sites: 0.5 |  |
| Pathloss  | UMa LOS and NLOS in table 5.2.2.1-1 of 38.803 | InH - Office LOS and NLOS in table 5.2.2.1-1 of 38.803 |
| Carrier frequency | 29GHz |
| BS antenna configuration | (Mg, Ng, M, N, P) = (1, 1, 8, 16, 2)(dv, dh) = (0.5λ, 0.5λ)GE,max = 8 dBi | (Mg, Ng, M, N, P) = (1, 1, 8, 16, 2)(dv, dh) = (0.5λ, 0.5λ)GE,max = 5 dBi |
| UE antenna configuration | PC1/PC5:(Mg, Ng, M, N, P) = (1, 1, 4, 4, 2) (dv, dh) = (0.5λ, 0.5λ)GE,max = 5 dBiPC3:(Mg, Ng, M, N, P) = (1, 1, 2, 2, 2) (dv, dh) = (0.5λ, 0.5λ)GE,max = 5 dBi |
| System bandwidth | 200MHz |
| ACIR | 15 dB |
| Target SNR at BS side | [25] dB |
| UE max output power | PC1: 35 dBm/PC3: 23 dBm/PC5: 23 dBm  |

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| [**R4-2216245**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216245.zip) | Huawei, HiSilicon | In the contribution, we provide proposals for the simulation assumption and preliminary simulation results to study the gain and operating SNR for UL 256QAM. |
| [**R4-2216251**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216251.zip) | Sony | **Observation 1 For 256QAM to exceed throuput performance of 64QAM SNR levels of 22 dB (EVM=3%) to 24 dB (EVM=4%) are required.** **Observation 2 256QAM is promising for PC1, PC2, and PC5, where higher EIRP is assumed.****Proposal 1 The target EVM shall be 3.5%**. |
| [**R4-2216350**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216350.zip) | Xiaomi | **Observation:****The simulation results show that supporting UL 256 QAM can provide significant performance gain over UL 64QAM for 3.5% EVM.** **For AWGN channel with 3.5% Tx EVM+3.5% Rx EVM, a SNR of >19.5 dB is needed for 29GHz, a SNR of >21.1 dB is needed for 39GHz and a SNR of >23.6 dB is needed for 48GHz.****For TDL-A and TDL-D fading channel with 3.5% Tx EVM+3.5% Rx EVM, a SNR of >22.5 dB is needed for 29GHz, a SNR of >25.2 dB is needed for 39GHz, due to lime limit, the related simulation for 48GHz haven’t been don’t.**And proposed:**Proposal 1: Based on link level simulation, 3.5% EVM for UL 256QAM is feasible for 29GHz and 39GHz.****Proposal 2: the PTRS configuration for UL 256QAM reference measurement channels could choose the maximum density:*** **For CP-OFDM: *LPT-RS* = 1 and *KPT-RS* = 2**
* **For DFT-s-OFDM: (,)=(8, 4)**
 |
| [**R4-2216426**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216426.zip) | ZTE Corporation | **Observation 1: For 29GHz:****256QAM performance gain can be expected in the following cases:*** **AWGN and TDL-D channel,**
* **TDL-A channel when MCS21(256QAM)/MCS23(64QAM) are selected,**
* **TDL-A channel when MCS23(256QAM)/MCS24(64QAM) and EVM3.0+3.0 or EVM3.5+3.5 are selected**

**However, 256QAM performance gain can not be expected in the following cases:*** **TDL-A channel when MCS23(256QAM)/MCS24(64QAM) and EVM4.0+4.0 are selected.**

 **Observation 2: For 39GHz:****256QAM performance gain can be expected in the following cases:*** **AWGN**
* **TDL-D and TDL-A channel when MCS21(256QAM)/MCS23(64QAM) are selected**

**However, 256QAM performance gain can not be expected in the following cases:*** **TDL-D and TDL-A channel when MCS23(256QAM)/MCS24(64QAM) are selected.**

**Observation 3: For 48GHz:****256QAM performance gain can not be expected for AWGN, TDL-D and TDL-A channel for all the MCS.** |
| [**R4-2216584**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216584.zip) | Anritsu Limited | ***Observation 1: Option 1 is based on a PTRS-DensityRecommendationUL IE that if its parameters are set correctly can provide better CPE compensation. While for Option 2, the parameters may not suit the actual UE and lead to not proper CPE compensation.******Proposal 1: Option 1 should be chosen as it could give better EVM (assuming optimized PTRS-DensityRecommendationUL parameters) and measurements should reflect that.*** |
| [**R4-2216784**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216784.zip) | Qualcomm Incorporated | **Proposal 1: For CP-OFDM, PTRS correction is implemented by de-rotation of each sub carrier in an OFDM symbol. The de-rotation angle is estimated as the frequency domain average of the phase rotation of all the PTRS tones in the allocation.****Proposal 2: For DFT-s-OFDM, PTRS correction is implemented by de-rotation of each time-domain symbol by the estimated instantaneous phase deviation.** **Proposal 3: The instantaneous phase deviation impacting a data symbol due to DUT phase noise is estimated by linearly interpolating between the phase deviations determined for the nearest neighbouring PTRS groups. The phase deviation for each PTRS group is determined as the time domain arithmetic mean phase deviation of all PTRS symbols in the group.****Observation 1: The EVM penalty due to PTRS-based corrections depends on number of active RBs.****Observation 2: The EVM benefit due to PTRS-based corrections depends on phase noise profile of the UE and modulation type (DFT-s or CP-OFDM).****Observation 3: UE example phase noise profiles 1 and 2 in TR38.803 are ill-suited for 256QAM.****Proposal 4:** **For UL 256QAM in FR2, the PTRS configuration shall be aligned with the UE’s recommended PTRS configuration (IE *PTRS-DensityRecommendationSetUL*).****Proposal 5: The EVM calculation signal flow including PTRS processing shall be included in the annex as normative content.** |
| [**R4-2216873**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216873.zip) | Ericsson Limited | **Observation 1: For 100 MHz channel bandwidth and K=2, L=1 PTRS configuration, in our view there is no additional benefit in using ICI compensation method compared with the case where only CPE compensation method is used.****Observation 2: If only CPE compensation method is used (with no ICI compensation) and having in mind the test implementation, it is reasonable to stick with a Rel-15 PTRS configuration of K=2, L=1 only.****Observation 3: Since in FR2-1 the phase noise effect is more severe compared with FR1, and since de-ICI filtering method is possibly not beneficial, in order to have sufficiently good channel estimation the DM-RS configuration with one additional DMRS symbol should be used (as the residual phase noise is included in the channel estimate).** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: EVM evaluation by link level simulation

Summary of link level simulation results based on CP-OFDM from companies:

29GHz:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter  | Nokia | LG Electronics | vivo | Huawei | Sony | Xiaomi | ZTE |
| Carrier frequency | 29 GHz | 29 GHz | 29 GHz | 29 GHz | 29 GHz | 29 GHz | 29 GHz |
| CBW | 50MHz | 100MHz | 50MHz/100MHz | 50MHz | 100MHz | 50MHz | 100MHz |
| SCS | 120kHz | 120kHz | 120kHz | 120kHz | 120kHz | 120kHz | 120kHz |
| Phase noise model | Option a): example1 (UE)  + example1(BS) | Option b): example2 (UE) + example2(BS) |  | Option d): example1 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) |
| Tx EVM=Rx EVM | 3% | 3.5% | 4% | 2% | 3% | 3.5% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% |
| Target SNR(dB) | TDL-A |  |  |  |  | 24.5 | 27 | 30 | 22.5/23.8 | 22.7/24 | 23.2/24.7 |  |  |  |  |  |  | 21.8 | 22.7 | 23.8 | 25.90 | 26.45 | 27.23 |
| MCS23 |  |  |  | 29 | NA | NA |  |  |  |  |  |  |  |  |  | 26.5 | 28 | NA | 31.49 | 34.31 | - |
| TDL-D | MCS21 | 24-25 | 18.5 | 20 | 21 | 20.3/21.5 | 20.8/21.8 | 21.2/22 | 19.9 | 20.1 | 20.3 |  |  |  | 21.8  | 22.5 | 23.1 | 23.42 | 23.73 | 24.16 |
| MCS23 | 28 | 32 | NA | 23 | 24.5 | 27 |  |  |  |  |  |  |  |  |  | 25.8 | 27.3 | NA | 28.44 | 30.10 | 34.28 |
| AWGN | MCS21 |  |  |  | 16 | 16.5 | 17 | 19.2/19.7 | 19.5/19.7 | 19.8/19.9 |  |  |  | 22 | 23 | 24 | 19.3 | 19.5 | 19.6 | 21.31 | 21.71 | 22.19 |
| MCS23 |  |  |  | 19 | 20 | 21 |  |  |  |  |  |  |  |  |  | 23 | 23.5 | 25.5 | 25.92 | 27.66 | 31.06 |

39GHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter  | Nokia | vivo | Huawei | Xiaomi | ZTE |
| Carrier frequency | 39 GHz | 39 GHz | 39 GHz | 39 GHz | 39 GHz |
| CBW | 50MHz | 50MHz/100MHz | 50MHz | 50MHz | 100MHz |
| SCS | 120kHz | 120kHz | 120kHz | 120kHz | 120kHz |
| Phase noise model | Option a): example1 (UE)  + example1(BS) |  | Option d): example1 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) |
| Tx EVM=Rx EVM | 0% | 3%-4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% |
| Target SNR(dB) | TDL-A | MCS21 |  |  | 28/NA | 29.2/NA | 34/NA |  |  |  | 25.2 | 26.7 | NA | 30.48 | 32.35 | 36.62 |
| MCS23 |  |  |  |  |  |  |  |  | NA | NA | NA | NA | NA | NA |
| TDL-D | MCS21 | 36 | NA | 24/NA | 25/NA | 25.8/NA | 20.8 | 21 | 21.2 | 24.1 | 25.2 | 28 | 26.36 | 27.50 | 29.23 |
| MCS23 |  |  |  |  |  |  |  |  | NA | NA | NA | NA | NA | NA |
| AWGN | MCS21 |  |  | 21.5/26 | 21.8/28 | 22/30 |  |  |  | 20 | 21.5 | 22 | 21.28 | 21.64 | 21.95 |
| MCS23 |  |  |  |  |  |  |  |  | NA | NA | NA | 25.86 | 27.64 | 30.62 |

48GHz:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter  | LG Electronics | vivo | Huawei | Xiaomi | ZTE |
| Carrier frequency | 48 GHz | 48 GHz | 48 GHz | 48 GHz | 48 GHz |
| CBW | 100MHz | 50MHz/100MHz | 50MHz | 50MHz | 100MHz |
| SCS | 120kHz | 120kHz | 120kHz | 120kHz | 120kHz |
| Phase noise model | Option b): example2 (UE) + example2(BS) |  | Option d): example1 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) | Option b): example2 (UE) + example2(BS) |
| Tx EVM=Rx EVM | 2% | 3% | 3.5% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% | 3% | 3.5% | 4% |
| Target SNR(dB) | TDL-A | MCS21 | NA | NA | NA | NA | NA | NA |  |  |  |  |  |  | NA | NA | NA |
| MCS23 | NA | NA | NA |  |  |  |  |  |  |  |  |  |  |  |  |
| TDL-D | MCS21 | 30 | NA | NA | NA | NA | NA | 22.4 | 22.6 | 23.2 |  |  |  | NA | NA | NA |
| MCS23 | NA | NA | NA |  |  |  |  |  |  |  |  |  |  |  |  |
| AWGN | MCS21 | 22.5 | 24 | 27.5 | NA | NA | NA |  |  |  | 24 | 25 | 28 | NA | NA | NA |
| MCS23 | NA | NA | NA |  |  |  |  |  |  | NA | NA | NA |  |  |  |

**Issue 2-1-1: EVM requirement for 29GHz**

* Proposals
	+ Option 1: 3.5% EVM for 29GHz and operating SNR of 32 dB.
	+ Option 2: 3.5% EVM for 29GHz and FFS for operating SNR. (i.e., use the average value based on the simulation results).
	+ Option 3: 3.5% EVM for 29GHz and FFS operating SNR with limited MCS.
	+ Option 4: Others.
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |

**Issue 2-1-2: EVM requirement for 39GHz**

* Proposals
	+ Option 1: 3.5% EVM for 39GHz and FFS for operating SNR. (i.e., use the average value based on the simulation results)
	+ Option 2: Others
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |

**Issue 2-1-3: EVM requirement for 48GHz**

* Proposals
	+ Option 1: 3.5% EVM for 48GHz and FFS for operating SNR. (i.e., use the average value based on the simulation results)
	+ Option 2: Further study is needed for 48GHz
	+ Option 3: UL 256QAM doesn’t apply to 48GHz.
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |

### Sub-topic 2-2: EVM test

**Issue 2-2-1: PTRS configuration**

* Proposals
	+ Option 1: PTRS configuration shall be aligned with the UE’s recommended PTRS configuration. (IE PTRS-DensityRecommendationSetUL)
	+ Option 2: Using a fixed PTRS configuration for all devices for the EVM test:
* For CP-OFDM: LPT-RS = 1 and KPT-RS = 2
* For DFT-s-OFDM: (,)=(8, 4)
	+ Option 3: Others.
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |
| Qualcomm  | Option 1. While we agree at a high level with the recommendations, it is not possible to use a general treatment for all UEs and all RB sizes. Note: Our contribution R4-2216784 has calculation results that show why a fixed configuration will not work. An example of an obviously fatal problem with option 2 is that it does not work for narrow allocations due to lack of available symbols.  |

**Issue 2-2-2: PTRS correction methods**

* Proposals
	+ Option 1:
* For CP-OFDM, PTRS correction is implemented by de-rotation of each sub carrier in an OFDM symbol. The de-rotation angle is estimated as the frequency domain average of the phase rotation of all the PTRS tones in the allocation.
* For DFT-s-OFDM, PTRS correction is implemented by de-rotation of each time-domain symbol by the estimated instantaneous phase deviation.
* The instantaneous phase deviation impacting a data symbol due to DUT phase noise is estimated by linearly interpolating between the phase deviations determined for the nearest neighbouring PTRS groups. The phase deviation for each PTRS group is determined as the time domain arithmetic mean phase deviation of all PTRS symbols in the group.
	+ Option 2: Others.
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |

**Issue 2-2-3: EVM calculation flow with PTRS**

* Proposals
	+ Option 1: The EVM calculation signal flow including PTRS processing shall be included in the annex as normative content.
	+ Option 2: Others
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |

**Issue 2-2-4: ICI compensation**

* Proposals
	+ Option 1: To consider ICI compensation only if sufficient performance improvement is shown by proponent with explanation of the underlying algorithm.
	+ Option 2: Others
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |
| Qualcomm | Option 1. Note that we need definition of details of the phase noise compensation procedure for MPR calculation much sooner than close of release. |

### Sub-topic 2-3: EVM budget in MPR simulation

**Issue 2-3: Phase noise assumption on EVM budget**

* Proposals
	+ Option 1: Using the findings recorded in TR 38.803 on phase noise for mm-wave frequencies as a basis.



* + Option 2: Others
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |
| Qualcomm | Option 2: We have shown in R4-2216784 that UE example 1 and 2 in TR38.803 are not good enough to support 256QAM operation.  |

### Sub-topic 2-4: System simulation assumption

**Issue 2-4: System simulation assumption**

* Proposals
	+ Option 1:

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Urban macro** | **Indoor** |
| Network layout | hexagonal grid, 19 macro sites, 3 sectors per site with wrap around | 50m x 120m, 12BSs |
| Inter-site distance | 200m (baseline)300m (optional) | 20m |
| BS antenna height | 25 m | 3 m |
| UE location | Outdoor/indoor | Outdoor and indoor | Indoor |
| Indoor UE ratio | 20% |  |
| Low/high Penetration loss ratio | 50% low loss, 50% high loss |  |
| LOS/NLOS | LOS and NLOS | LOS and NLOS |
| UE antenna height | Same as 3D-Uma in TR 36.873 | 1 m |
| UE distribution (horizontal) | Uniform |
| Minimum BS – UE distance (2D) | 35 m | 0 m |
| Shadowing correlation | Between cells: 1.0Between sites: 0.5 |  |
| Pathloss  | Uma LOS and NLOS in table 5.2.2.1-1 of 38.803 | InH – Office LOS and NLOS in table 5.2.2.1-1 of 38.803 |
| Carrier frequency | 29GHz |
| BS antenna configuration | (Mg, Ng, M, N, P) = (1, 1, 8, 16, 2)(dv, dh) = (0.5λ, 0.5λ)GE,max = 8 dBi | (Mg, Ng, M, N, P) = (1, 1, 8, 16, 2)(dv, dh) = (0.5λ, 0.5λ)GE,max = 5 dBi |
| UE antenna configuration | PC1/PC5:(Mg, Ng, M, N, P) = (1, 1, 4, 4, 2) (dv, dh) = (0.5λ, 0.5λ)GE,max = 5 dBiPC3:(Mg, Ng, M, N, P) = (1, 1, 2, 2, 2) (dv, dh) = (0.5λ, 0.5λ)GE,max = 5 dBi |
| System bandwidth | 200MHz |
| ACIR | 15 dB |
| Target SNR at BS side | [25] dB |
| UE max output power | PC1: 35 dBm/PC3: 23 dBm/PC5: 23 dBm  |

* + Option 2: modification is needed. (Please list which parameters need to be modified and how modify)
	+ Option 3: Others.
* Recommended WF
	+ TBA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | …. |
| Qualcomm | Option 3: Some context would be helpful. What is the aim of the simulation study? What are possible outcomes for the WI? |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents