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

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

**Agenda item:** 9.1

**Source:** Moderator (T-Mobile USA)

**Title:** Email discussion summary for 96e[123] LTE\_NR\_B41\_Bn41\_PC29dBm

**Document for:** Information

# Introduction

This e-mail discussion targets completion of the 29 dBm HPUE Work Item. The remaining issue is agreement on MPR and A-MPR for 29 dBm HPUE UL MIMO and Tx Diversity in NR band n41.

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

* 1st round: Companies to provide comments for the 1st round by Wednesday 5pm UTC Aug. 19
* 2nd round: TBA

# Topic #1: MRP and A-MPR for PC1.5 UL MIMO and TxD

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2009943**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009943.zip) | Apple Inc. | **Proposal:** Define PC1.5 UL MIMO MPR according to Table2.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Modulation | | MPR (dB) | | | | Edge RB  allocations | Outer RB  allocations | Inner RB  allocations | | DFT-s-OFDM | Pi/2 BPSK | 5.5 | 3.0 | 1.0 | | QPSK | 5.5 | 3.0 | 1.0 | | 16 QAM | 5.5 | 4.0 | 2.0 | | 64 QAM | 5.5 | 4.0 | 3.0 | | 256 QAM | 7.5 | | | | CP-OFDM | QPSK | 5.5 | 4.0 | 2.0 | | 16 QAM | 5.5 | 4.5 | 2.5 | | 64 QAM | 5.5 | 5.0 | 4.0 | | 256 QAM | 9.5 | | |   Table2: Proposal for PC1.5 UL-MIMO MPR |
| **[Re](ftp://3gpp.org/tsg_ran/WG4_Radio/TSGR4_96_e/Inbox/Drafts/%5B123%5D%20LTE_NR_B41_Bn41_PC29dBm/REV_R4-2011449%20Measurements_for_PC1.5.zip)**[v\_R](ftp://3gpp.org/tsg_ran/WG4_Radio/TSGR4_96_e/Inbox/Drafts/%5B123%5D%20LTE_NR_B41_Bn41_PC29dBm/REV_R4-2011449%20Measurements_for_PC1.5.zip)**[4-2011449](ftp://3gpp.org/tsg_ran/WG4_Radio/TSGR4_96_e/Inbox/Drafts/%5B123%5D%20LTE_NR_B41_Bn41_PC29dBm/REV_R4-2011449%20Measurements_for_PC1.5.zip)** | T-Mobile USA | **Observation 1: The original UL-MIMO MPR definition appears to assume that for each Tx chain, 3dB lower output power results in 3dB of lower emissions power, a 1:1 backoff ratio. This implies an assumption that a 2Tx UL-MIMO design would simply use two copies of the same Tx chain hardware (PA, etc.) used for 1Tx, for the same total power. (e.g. PC3 UL-MIMO would use two Tx chains identical to what is used for 1Tx PC3.)**  **Observation 2: If the “at each antenna connector” language in the original LTE UL-MIMO and Rel-15 NR UL-MIMO MPR specifications was an error, the relaxation of MPR proposed in [9] is not justified by fixing the language to what it should have been, “as the sum of powers from each antenna connector.”**  **Observation 3: Despite possibly double-counting the relaxation needed for summing the antenna connector powers, the MPR relaxations proposed in [9] may still be reasonable projections for outer allocations, because 2Tx R-IMD is not accounted for in either the original UL-MIMO MPR definition or in [9].**  **Observation 4: An extremely conservative upper bound estimate for PC1.5 MPR and A-MPR allowances would be to add 3dB to the corresponding MPR and A-MPR values for PC2, which would allow no transmit power benefit for PC1.5.**  **Observations 5: The rationale and methodology used in [9] could also be applied to DFT-S-OFDM MPR allowances to estimate values for Transmit Diversity.**  **Observation 6: The difference between emission from TxD and UL-MIMO are small, generally <= 0.5 dB.**  **Observation 7: Inner allocations appear to have large margins against OOBE and ACLR specification with low MPR, and MPR increases do not appear to be a effective tool for potential EVM issues.**  **Proposal 1: That CP-OFDM MPR for PC1.5 for outer and edge allocations be based on PC2 values from [9] plus 1.5dB, and that DFT-S-OFDM MPR for PC1.5 for outer and edge allocations be projected using the same methodology.**  **Proposal 2: That CP-OFDM MPR for PC1.5 for inner allocations be based on PC2 values from [9] without further additions, and that DFT-S-OFDM MPR for PC1.5 for inner allocations be based on the methodology from [9] with no further additions.**  **Proposal 3: That NS\_04 A-MPR values for PC1.5 be based on corresponding PC2 A-MPR values, plus 1.5 dB.** |

## 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 MPR for PC1.5 UL MIMO and Tx Diversity

*Sub-topic description: Agreement is needed on MPR for PC 1.5 HPUE and UL MIMO Tx Diversity.*

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

**Issue 1-1: MPR**

* Proposals
  + Option 1: Apple proposal in [R4-2009943](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009943.zip)
  + Option 2: T-Mobile USA proposal in [Rev\_R4-2011449](ftp://3gpp.org/tsg_ran/WG4_Radio/TSGR4_96_e/Inbox/Drafts/%5B123%5D%20LTE_NR_B41_Bn41_PC29dBm/REV_R4-2011449%20Measurements_for_PC1.5.zip) that merges data from R4-2009943 as well as previous data from Skyworks and LGE.
* Recommended WF
  + Approve Option 2.

### Sub-topic 1-2 A-MPR for PC1.5 UL MIMO and Tx Diversity

*Sub-topic description: Agreement is needed for A-MPR for PC 1.5 HPUE and UL MIMO Tx Diversity.*

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

**Issue 1-2: TBA**

* Proposals
  + Option 1: T-Mobile USA proposal in [Rev\_R4-2011449](ftp://3gpp.org/tsg_ran/WG4_Radio/TSGR4_96_e/Inbox/Drafts/%5B123%5D%20LTE_NR_B41_Bn41_PC29dBm/REV_R4-2011449%20Measurements_for_PC1.5.zip)
  + Option 2: N/A
* Recommended WF
  + Approve Option 1.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2: |
|  |  |

### 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** |
| [**R4-2010060**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2010060.zip) | CR for 38.101-1: Introduction of Power Class 1.5 (To be revised based on the conclusion of the MPR/A-MPR discussions) |
| Company A |
| Company B |
|  |
| [**R4-2010061**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2010061.zip) | CR for 38.307: Introduction of Power Class 1.5 |
| 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#1-1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |
| **Sub-topic#1-2** | *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”* |