3GPP TSG-RAN WG1 Meeting #101 Tdoc R1-2004504

eMeeting, May 25th – June 5th, 2020

Agenda Item: 7.2.6.5

Source: Moderator (Ericsson)

Title: FL summary 1 of low PAPR RS

Document for: Discussion

# 1 Introduction

This document contains the feature lead summary of critical issues related to maintenance of the low PAPR RS topic under Rel-16 eMIMO WI. Note that the number of low PAPR RS sub topics is restricted to two topics in this e-meeting.

Hence, the first phase discussion will be used to select two topics from the below list of six. In addition, if there are no objections, the editorial issues will be sent to the corresponding editors for inclusion in the next version of the specification.

# 2 Low PAPR RS maintenance issues

In the summary below, six identified issues are found plus two editorials.

## 2.1 Identified issues

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| Issue # | Description | Tdoc |
| 1 | For PUSCH, clarify in 38.211 that is given by antenna ports field in DCI | R1-2003400 |
| 2 | In 38.214, there is a missing case for determining the : “the higher-layer parameter *dmrsUplinkTransformPrecoding-r16* is configured and π/2-BPSK modulation is not used for PUSCH”. | R1-2003534  R1-2004268  R1-2003707 |
| 3 | It was agreed that the PUCCH with pi/2-BPSK DMRS multiplexing capacity is a single port, the spec is missing the description | R1-2003663  R1-2004268 |
| 4 | Proposal to improve interference randomization for the case of length 12 and 24 CGS sequences for PUCCH. | R1-2003744 |
| 5 | A sentence that the low-PAPR sequence of type 2 changes for different values of and in Section 5.2.3 is incorrect and should be removed/replaced. | R1-2004050 |
| 6 | RAN1 have introduced different DMRS sequence  on different DMRS ports associated with different CDM group in Rel.16 PUSCH, The specification in 38.211, clause 6.4.1.2.1.1 does not clearly specify  for a PTRS port  or  is based on which CDM group | R1-2004466 |

## 2.2 Editorial issues

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| Issue # | Description | Tdoc |
| 7 | In 38.212, the reference to 38.211 is wrong, it should be Clause 6.4.1.1.1.2 instead of 6.4.1.1.1. | R1-2003400 |
| 8 | In Section 7.4.1.1.1 of TS 38.211, *dmrsDownlink-r16* should be *dmrs-Downlink-r16* | R1-2004050 |

## 2.3 Discussion

This low PAPR subtopic allows two issues/threads to be selected for the e-meeting discussions next week. Please share your views on the priority of these issues (1-6) by the following, using the first table below.  Please also indicate whether you are OK or not with the editorial issue 7, in which case there are no concerns, I will notify the spec editor(s) for inclusion in the next spec version.

* H- High priority
* M-Medium priority
* L-Low priority
* N-Not needed/disagree that this is an issue

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Issue Index** | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7 (editorial)** | **8 (editorial)** |
| Ericsson | L | H | M | N | L | L | OK |  |
| ZTE | L | H | H | N | L | L | should be 6.4.1.1.1.2 |  |
| Nokia/NSB | L | H | H | N | L | L | 6.4.1.1.1 is still OK, but also fine with 6.4.1.1.1.2 as ZTE indicated. |  |
| Samsung | L | H | M | N | L | L | OK with ZTE’s correction |  |
| OPPO | L | H | H | N | L | L | L | L |
| vivo | L | H | H | N | L | L | Agree with ZTE’s correction |  |
| QC | L | M | N | L | L | M | Agree with ZTE proposal | L |
| MediaTek | M | H | H | N | L | M | Agree with ZTE’s correction |  |
| Huawei, HiSilicon | N | H | H | L | M | N | L | ok |
| Intel | L | H | N | M | L | L | OK | OK |
| LG | L | H | M | N | L | L | OK | OK |

Also, if you have comments, please use the table below:

|  |  |
| --- | --- |
| **Company** | **Comment** |
| Ericsson | Issue 1,5 and 6 can be handled in company CR phase later. Issue 2 and 3 seem most useful for discussion. Issue 4 may be technically useful but is not an essential correction. |
| ZTE | - Issue 3 has been raised in several meetings. We hope to close it in this meeting. Either to agree or reject it is fine for us.  - We sympathize the issue 4 technically, but it is too late to further check the evaluation.  - Issue 6 is nothing related with low PAPR RS. In addition, it is clear enough for the relationship between DMRS port and CDM group based on table 6.4.1.1.3-1 in 38.211. |
| Nokia/NSB | Issue 1 and 5 are fine but not so urgent. Issue 6 is clear enough with the current text, so we dont see it is required. Issue 2 and 3 shall be discused in thie meeting.  Issue 4 is technically fine but not seems critical but ist complexity.  In addition, in R1-2004268, there is one editorial correction to clarify the configured grant shall be „type 1“. If possible, it can be discussed with Issue 2. |
| OPPO | Issue 1, 5, 6, 7, 8 can be regarded as editorial changes in some sense (Editorial change in R1-2004050 is missing. Thus I add it as Issue 8)  Issue 2: The condition should be included  Issue 3: It is prefered to capture the previous agreement  Issue 4: Too late to discusison new optimization at the maintanence stage |
| vivo | Issue 2 and 3 should be discussed with high priority.  Issue 1, 5, 6 can be left to next meeting.  The intention of issue 7 is changing 6.4.1.1.1.1 to 6.4.1.1.1.2 for antenna ports field in DCI format 0\_1, which is algined with antenna ports field in DCI format 0\_2. |
| QC | We don’t think issue 3 is an issue. First of all, spec is not broken so no change is needed. Secondly, issue 3 is on UCI symbol waveform generation so it is out of the scope of this agenta item, which is \*low PAPR RS\*. Thirdly, the proposal removes UCI spreading for PUCCH format 4, which is an NBC change – meaning Rel-16 PUCCH format 4 UCI OFDM symbol waveform generation is completely different from Rel-15 PUCCH format 4. We don’t see the motivation to create a new PUCCH format 4 for Rel-16 with Pi/2 BPSK DMRS.  The CR adopted in last meeting removed cyclic shift on DMRS hence clarified that DMRS for PUCCH format 4 is with only a single port. The spec is clear now. We don’t see the need for RAN1 to further discussion this issue. As a matter of fact, having said before, we don’t see there is any issue needs to be discussed here. |
| Huawei, HiSilicon | For Issue-1: adding description of antenna ports fild is not necessary, since the impact of n\_SCID is already captured in antenna port field in 212.  For Issue-2 and 3, it is high priority to handle.  For Issue-4, it seems some further enhancement.  For Issue-5, the issue is discussed in last meeting but missing capture, so better to address or leave to editor.  For Issue-6, it seems not necessary. Since the sequence r(m) is already related to CDM group index. PTRS only reuse it. Not necessary to emphsis on it.  For Issue-7 and 8, leave to editor. |
| Intel | Issue – 1: This is a minor editorial correction. Even without this, from 38.212 it is pretty clear that antenna port field indicates .  Issue – 2: OK to clarify since current specification is missing this case (Note that the CR is related to 38.211 not 214 as in Table 2.1)  Issue – 3: Since cyclic shift was removed from specification, we tend to agree with Qualcomm. Specifying as in the TP from R1-2004268 has no impact on port multiplexing. In current specification, there is in fact no methodology to multiplex ports for PUCCH format 4 with Rel-16 DM-RS. In case is chosen, it would still be single port DM-RS and that should be enough to account for the DM-RS agreement.  Issue – 4: In the last meeting there was extensive discussion on this topic and quite a few companies including operators indicated that cell-edge PUCCH performance was critical. However, rather than copying a Rel-15 solution designed for constant modulus sequences, our proposal was to have a technical discussion on possible solutions. This proposal is a solution to the actual problem that exists in current specification without compromising the single symbol use-case.  Issue – 5: This is editorial. Spec is not broken even if this is retained.  In the case that we select between issue 1 and 5 for the second email thread, our preference is issue 5 for better clarification. |
| LG | It seems that issue 2 and issue 3 need to be discussed to complete spec, but issue 4 seems an optimization rather than essential one, and we are fine with minor editorial changes for correct spec description. |

# 3 FL proposal

Based on the discussion, it seems issue #2 and #5 can be resolved at this meeting.

FL suggest the following two issues for email discussion:

## 3.1 Email discussion #1

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| Issue #2 | In 38.214, there is a missing case for determining the : “the higher-layer parameter *dmrsUplinkTransformPrecoding-r16* is configured and π/2-BPSK modulation is not used for PUSCH”. |

Proposal is to agree on the TP from R1-2003707

**In TS 38.211 Section 6.4.1.1.1.2**

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6.4.1.1.1.2 Sequence generation when transform precoding is enabled

<unchanged text omitted>

The sequence group , where is given by

- if is configured by the higher-layer parameter *nPUSCH-Identity* in the *DMRS-UplinkConfig* IE and,

- the higher-layer parameter *dmrsUplinkTransformPrecoding-r16* is not configured or the higher-layer parameter *dmrsUplinkTransformPrecoding-r16* is configured and π/2-BPSK modulation is not used for PUSCH, and

- the PUSCH is neither scheduled by RAR UL grant nor scheduled by DCI format 0\_0 with CRC scrambled by TC-RNTI according to clause 8.3 in [5, TS 38.213];

- if the higher-layer parameter *dmrs-UplinkTransformPrecoding-r16* is configured, π/2-BPSK modulation is used for PUSCH, the PUSCH transmission is not a msg3 transmission, and the transmission is not scheduled using DCI format 0\_0 in a common search space;

- otherwise

<unchanged text omitted>

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## 3.2 Email discussion #2

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| Issue #5 | A sentence that the low-PAPR sequence of type 2 changes for different values of and in Section 5.2.3 is incorrect and should be removed/replaced. |

Proposal is to agree on the TP from R1-2004050:

**In TS 38.211 Section 5.2.3**

<omitted text>

5.2.3 Low-PAPR sequence generation type 2

The low-PAPR sequence is defined by a base sequence according to

where is the length of the sequence, , . ~~Multiple sequences are defined from a single base sequence through different values of and .~~

Base sequences are divided into groups, where is the group number and is the base sequence number within the group, such that each group contains one base sequence () of length , . The sequence is defined by

where the definition of depends on the sequence length.

<omitted text>

## 3.3 Editorial issues

Proposal is to send these two corrections to the corresponding spec editors for inclusion in next version of spec

|  |  |  |
| --- | --- | --- |
| Issue # | Description | Tdoc |
| 7 | In 38.212, the reference to 38.211 is wrong, it should be Clause 6.4.1.1.1.2 instead of 6.4.1.1.1. (see R1-2003400 for context) | R1-2003400 |
| 8 | In Section 7.4.1.1.1 of TS 38.211, *dmrsDownlink-r16* should be *dmrs-Downlink-r16* | R1-2004050 |