3GPP TSG-RAN WG1 Meeting #100bis-e R1-2002726

Online, April 13th-30th, 2020

Agenda Item: 7.2.6.5

Source: Moderator – (Ericsson)

Title: Feature lead summary #2 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 email 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

## 2.1 Identified issues

|  |  |  |
| --- | --- | --- |
| Issue # | Description | Tdoc |
| 1 | For PUCCH format 3 and 4, the used sequence does not depend on the cyclic shift $α$. The specification text in 38.211 does however describe the cyclic shift of the sequence, which is undefined. The open issue is whether to remove the text describing the dependence or alternatively define how cyclic shifts of the used sequence shall be applied.  | R1-2001566R1-2001681R1-2001729R1-2001825R1-2001908R1-2002007R1-2002273R1-2002297R1-2002554 |
| 2 | It should be clarified by RAN1 if the agreed π/2-BPSK DMRS in Rel-16 (when configured) is used for PUSCH scheduled by DCI 0\_2 or not. In current specification it is not used for DCI format 0\_2 based PUSCH and the proposal is to introduce it for DCI 0\_2.  | R1-2001599R1-2001908 |
| 3 | Sequence initialization for pi/2 BPSK DMRS according to DCI 0\_1 is specified in 38.211 while it is missing in 38.212. Proposal is to introduce the corresponding text in 38.212.  | R1-2001825 |
| 4 | Clarification of the number of ports for PUCCH format 3/4 when new DMRS is applied. The TP introduces some clarifying text to make clear in specifications the agreement on a single port for pi/2 BPSK based PUCCH.  | R1-2002297 |
| 5 | Clarification of the condition for applying different identity for the $n\_{ID}^{RS}$. Proposal to specify that - $n\_{ID}^{RS}=n\_{ID}^{PUSCH}$ is used then pi/2 BPSK based PUSCH is not scheduled.  | R1-2002297 |
| 6 | The identified issue relates to ambiguity of PTRS sequence when Pi/2 BPSK is enabled for PUSCH | R1-2002554 |

## 2.2 Editorial issues

|  |  |  |
| --- | --- | --- |
| Issue # | Description | Tdoc |
| 7 | RRC parameter alignments: *dmrs-UplinkTransformPrecoding-r16**pi2BPSK-ScramblingID0**dmrs-Downlink-r16* | R1-2001681R1-2001729 |

# 3 Email discussion – first phase

Based on the email discussion (summary captured below), FL proposal is that we discuss these two topics next week since several companies have indicated them as high priority:

1. **Issue #1+#4** combined
	1. Including vivo’s issue pointed to be handled together with #1
	2. Note is taken that Samsung prefer to discuss issue #1 first.
	3. Note is also taken that Qualcomm don’t see #4 as necessary.
	4. Let’s try to handle these issues step-wise or by TP alternatives, next week.
2. **Issue #2**

In addition, FL will notify the editors about the editorial corrections in Issue #7.

## 3.1 Email discussion

The summary for AI.7.2.6.5 (Low PAPR RS) was been uploaded to inbox as  R1-2002693.zip. In the summary, six identified issues are found plus one editorial. This low PAPR subtopic allows **two issues/threads** to be selected for  the e-meeting discussions next week. Companies views on the priority of these issues (1-6) are indicated below.

Companies 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

|  |  |
| --- | --- |
| **Company** | **Issue Index** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7 (editorial)** |
| Ericsson | H | M | L | M | L | L | OK |
| ZTE | H | H | N | L | L | L | OK |
| OPPO | H | H | N | M | M | L | OK |
| vivo | H | H | L | M | L | L | OK |
| Intel | H | M | N | M | L | L | OK |
| Nokia/NSB | H | L | N | H | M | L | OK |
| Samsung | H | M | N | M | L | L | OK |
| Huawei, HiSilicon | M | H | N | H | M | L | OK |
| MediaTek | H | H | N | H | M | L | OK |
| QC | M | H | N | N | L | M | OK |

 *Note: The issue pointed out by vivo in email discussion (new DMRS only applicable for pi/2-BPSK on PUCCH F3 and F4) is handled under Issue#1.*

Companies comments are captured below:

|  |  |
| --- | --- |
| **Company** | **Comment** |
|  ZTE |  Issue 3 does not exist because nSCID for new DMRS is indicated by ‘Antenna port(s)’ field instead of ‘DMRS sequence initialization’ field. Please check table 7.3.1.1.2-6A in 38.212. |
|  OPPO |  Share the same view as ZTE |
|  Intel | * Issue 3 does not need to be adressed as stated by ZTE
* Issue 4 (at least based on the TP in R1-2002297) seems somewhat related to the PUCCH DM-RS discussion in Issue 1. Maybe 1 and 4 can be discussed together, along with the issue raised by VIVO
 |
| Nokia/NSB | * Agree with ZTE comment on Issue 3.
* As Intel indicated, Issue 4 is good to be discussed with Issue 1.
 |
| Samsung | Regarding Issue 4, we do not object to discuss Issue 4 but believe that Issue 1 should be handled first. |
| Huawei, HiSilicon | For Issue-1, it is beneficial to update the spec, however, even without any change, the current spec is still clear, i.e., the cyclic shift does not work. Issue-4 is related with Issue-1, similar view with Intel and Nolia that it can be discussed together. |
| MediaTek | Agree with ZTE regarding issue 3 |
| QC | We don’t think issue 4 is an issue, at least it is not an issue related to DMRS. The TP proposed for issue 4 is related to PUCCCH UCI symbol waveform generation, which is out of the scope of Pi/2 BPSK DMRS discussion. Reply email to FL proposal: Unfortunately, I don’t agree to combine issue #1+#4. Like I commented, TP for issue 4 is proposing change on PUCCH **UCI symbol** waveform generation, which is out of the scope of Pi/2 BPSK **DMRS** discussion. To be more specific, the TP is proposing remove spreading on UCI with PUCCH format 3 for NR-U when Rel-16 Pi/2 BPSK DMRS is used. Even there is no much benifit, why single port Rel-16 Pi/2 BPSK DMRS can not be used together with spreading factor = 2 or 4 on UCI symbol for NR-U PUCCH format 3? DMRS port and UCI spreading are two related but orthogonal things. I don’t see the need to discuss #4 at all. Even if it need to be discussed, this TP should be submitted to NR-U maintence, not under this **low PAPR RS** agenda.  In summary, I am OK to discuss Issue #1, but not the combined issue #1+#4.  |