

3GPP TSG RAN Rel-18 Workshop RWS-210618 Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.3 **Source:** EURECOM **Title:** Email Discussion Summary for RAN-R18-WS-crossFunc-EURECOM

1 Introduction

This email discussion covers the following documents:

RWS-210507: "Evolution for Coverage Enhancement in Rel-18"

1.1 Summary of Proposals

In our contribution RWS-210507, we propose to continue the work in SI TR 38.830 and specify novel PUCCH enhanced PUCCH Formats for Rel-18.

2 Round 1 Q&A

2.1 Questions and Comments

Questions and comments for the first round: June 14 08:00 UTC – June 17 8:00 UTC

Feedback Form 1: Round 1 QA for RWS-210507: Questions AND Comments

1 – BBC

Coverage Enhancement

The BBC supports measures to enhance cell coverage in order to improve the delivery of media services over 5G networks, especially in rural areas.

2 – Intel Deutschland GmbH

There were quite extensive studies for sequence based PUCCH during Rel-17 coverage enhancement SI phase, but there was not consensus to support it for coverage enhancement, including the performance gain. Can you please clarify the motivation to reopen the discussion? And also can you clarify the targeted PUCCH format?

3 – SHARP Corporation

Would you tell us more about "structured code" and "unequal error protection"?

4 – InterDigital Communications

We are supportive of coverage enhancements for PUCCH. What does “structured code” mean for the large payload design?

2.2 Answers

Answers will be provided June 17 8:00 UTC – June 18 23:59 UTC

2.2.1 Intel Deutschland GmbH

Thank you for your feedback. In the SI, there was a clear majority of companies that showed promising performance gains for DMRS-less PUCCH. Moreover, many companies were supporting DMRS-less PUCCH in the WI scope in Rel-17. Only due to limited TUs for the WI a down-selection for the PUCCH enhancements had to be made and DMRS-less PUCCH was left for future work. Thus, in our opinion it is not a matter of reopening the discussion but to continue our efforts to improve PUCCH coverage.

For enhancement, we consider the same PUCCH formats identified in the SI, i.e. PUCCH Format 1, PUCCH Format 3 with 11 bits and 22 bits

2.2.2 SHARP Corporation

Thank you for your feedback. Unequal error protection means that in the payload some bits are more protected than others. Those higher protected bits can also be decoded independently of the other bits. For instance, it can be applied when the payload includes both HARQ-ACK bits and CSI. In this case, the HARQ bits could enjoy higher error protection than the CSI bits. Simulation results show, cf. R1-2008939 Figure 5, that about 1.5 dB gain can be achieved for 3 protected bits compared to the 8 remaining bits in the proposed 11-bit PUCCH transmission scheme.

With the term “structure code” we refer to a strong signal code that enables low-complexity receivers. Depending on the size of the payload, this signal code can be orthogonal or a non-coherent code.

2.2.3 InterDigital Communications

For larger payloads (>11 bits), a structure code refers to a non-coherent linear code to enable low-complexity receivers.

3 Round 2 Q&A

Questions and comments for the second round: June 21 08:00 UTC – June 23 8:00 UTC

3.1 Questions and Comments

**Feedback Form 2: Round 2 QA for RWS-210507: Questions
AND Comments**

3.2 Answers

Answers will be provided June 23 8:00 UTC – June 24 18:00 UTC

No comments received in the 2. round.

4 Summary

In this email discussion we propose to continue the work on coverage enhancements. In particular, the specification of DMRS-less enhanced PUCCH transmission schemes which showed promising gains by multiple companies during the SI phase.

Three companies expressed their support for further coverage enhancements and one company inquired about the motivation.