3GPP TSG-RAN WG1 Meeting #106-e Tdoc R1-21xxxxx

e-Meeting, 16th – 27th August, 2021

Agenda Item: 7.2.2

Source: Moderator (Ericsson)

Title: Feature lead summary for Maintenance of UL Signals and Channels

Document for: Discussion, Decision

# 1 Introduction

This document contains a summary of proposals related to UL Signals and Channels made under the agenda item 7.2.2 "Maintenance of NR-based Access to Unlicensed Spectrum." Only one issue is identified.

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| **#** | **Issue** | **Contribution(s)** |
| UL-01 | Clarification of OCC code index for PUCCH resource set prior to RRC configuration | [1]: R1-2107234 |

# 2 Issue UL-01: Clarification of OCC code index for PUCCH resource set prior to RRC configuration

For PUCCH resource sets prior to RRC configuration, if interlacing is configured for PUCCH, and if row 3, 7, or 11 of Table 9.2.1-1 is used, and if $r\_{PUCCH}\geq 10$, then OCC index 1 is used. Otherwise index 0 is used. Currently, in 38.213 Section 9.2.1, there could be some ambiguity on whether OCC index 0 or 1 is used. A CR to 38.213 Section 9.2.1 is proposed in [1] to resolve potential ambiguity. The proposed CR is copied in the Appendix for convenience.

The moderator's recommendation is to discuss this issue.

# References

1. R1-2107234, "Draft CR on PUCCH resource determination," OPPO, RAN1#106-e, August 2021.

## Appendix – Proposed CR to 38.213 from [1]

---------------------------------------------------- CR to 38.213, Section 9.2.1 -------------------------------------------------

9.2.1 PUCCH Resource Sets

If a UE does not have dedicated PUCCH resource configuration, provided by *PUCCH-ResourceSet* in *PUCCH-Config*, a PUCCH resource set is provided by *pucch-ResourceCommon* through an index to a row of Table 9.2.1-1 for transmission of HARQ-ACK information on PUCCH in an initial UL BWP of $N\_{BWP}^{size}$ PRBs.

The PUCCH resource set includes sixteen resources, each corresponding to a PUCCH format, a first symbol, a duration, a PRB offset $RB\_{BWP}^{offset}$, and a cyclic shift index set for a PUCCH transmission.

The UE transmits a PUCCH using frequency hopping if not provided *useInterlacePUCCH-PUSCH* in *BWP-UplinkCommon*; otherwise, the UE transmits a PUCCH without frequency hopping.

An orthogonal cover code with index 0 is used for a PUCCH resource with PUCCH format 1 in Table 9.2.1-1 except when index 3, 7, or 11 is indicated by *pucch-ResourceCommon* and *useInterlacePUCCH-PUSCH* in *BWP-UplinkCommon* is provided.

The UE transmits the PUCCH using the same spatial domain transmission filter as for a PUSCH transmission scheduled by a RAR UL grant as described in clause 8.3.

If a UE is not provided any of *pdsch-HARQ-ACK-Codebook*, *pdsch-HARQ-ACK-Codebook-r16*, or *pdsch-HARQ-ACK-OneShotFeedback*, the UE generates at most one HARQ-ACK information bit.

If the UE provides HARQ-ACK information in a PUCCH transmission in response to detecting a DCI format scheduling a PDSCH reception or a SPS PDSCH release, the UE determines a PUCCH resource with index $r\_{PUCCH}$, $0\leq r\_{PUCCH}\leq 15$, as $r\_{PUCCH}=\left⌊\frac{2⋅n\_{CCE,0}}{N\_{CCE}}\right⌋+2⋅∆\_{PRI}$, where $N\_{CCE}$ is a number of CCEs in a CORESET of a PDCCH reception with the DCI format, as described in clause 10.1, $n\_{CCE,0}$ is the index of a first CCE for the PDCCH reception, and $∆\_{PRI}$ is a value of the PUCCH resource indicator field in the DCI format.

If $\left⌊{r\_{PUCCH}}/{8}\right⌋=0$ and a UE is provided a PUCCH resource by *pucch-ResourceCommon* and is not provided *useInterlacePUCCH-PUSCH* in *BWP-UplinkCommon*

- the UE determines the PRB index of the PUCCH transmission in the first hop as $RB\_{BWP}^{offset}+\left⌊{r\_{PUCCH}}/{N\_{CS}}\right⌋$ and the PRB index of the PUCCH transmission in the second hop as $N\_{BWP}^{size}-1-RB\_{BWP}^{offset}-\left⌊{r\_{PUCCH}}/{N\_{CS}}\right⌋$, where $N\_{CS}$ is the total number of initial cyclic shift indexes in the set of initial cyclic shift indexes

- the UE determines the initial cyclic shift index in the set of initial cyclic shift indexes as $r\_{PUCCH}modN\_{CS}$

If $\left⌊{r\_{PUCCH}}/{8}\right⌋=1$ and a UE is provided a PUCCH resource by *pucch-ResourceCommon* and is not provided *useInterlacePUCCH-PUSCH* in *BWP-UplinkCommon*

- the UE determines the PRB index of the PUCCH transmission in the first hop as $N\_{BWP}^{size}-1-RB\_{BWP}^{offset}-\left⌊{\left(r\_{PUCCH}-8\right)}/{N\_{CS}}\right⌋$ and the PRB index of the PUCCH transmission in the second hop as $RB\_{BWP}^{offset}+\left⌊{\left(r\_{PUCCH}-8\right)}/{N\_{CS}}\right⌋$

- the UE determines the initial cyclic shift index in the set of initial cyclic shift indexes as 

If a UE is provided a PUCCH resource by *pucch-ResourceCommon* and is provided *useInterlacePUCCH-PUSCH* in *BWP-UplinkCommon*

- the UE determines for the PUCCH resource an interlace index $m$ as $m=\left(m\_{0}+\left⌊{r\_{PUCCH}}/{N\_{CS}}\right⌋\right)modM$ where $M$ is a number of interlaces [4, TS 38.211] and $m\_{0}=RB\_{BWP}^{offset}$ is an interlace index offset and $RB\_{BWP}^{offset}$ is as given in Table 9.2.1-1

- the UE determines an initial cyclic shift index in a set of initial cyclic shift indexes as $r\_{PUCCH}modN\_{CS}$, where $N\_{CS}$ is the total number of initial cyclic shifts indexes in the set of initial cyclic shift indexes in Table 9.2.1-1

- if *pucch-ResourceCommon* indicates

- index 0: the first symbol is 9 for a PUCCH resource with PUCCH format 0 if $r\_{PUCCH}\geq 10$

- index 1 or 2: the first symbol is 9 for a PUCCH resource with PUCCH format 0 if $r\_{PUCCH}=15$

- index 3, 7, or 11: an orthogonal cover code with index 1 is used for a PUCCH resource with PUCCH format 1 if $r\_{PUCCH}\geq 10$; otherwise, an orthogonal cover code with index 0 is used

- the UE does not expect *pucch-ResourceCommon* to indicate index 15

**Table 9.2.1-1: PUCCH resource sets before dedicated PUCCH resource configuration**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **PUCCH format** | **First symbol** | **Number of symbols** | **PRB offset**  | **Set of initial CS indexes** |
| 0 | 0 | 12 | 2 | 0 | {0, 3} |
| 1 | 0 | 12 | 2 | 0 | {0, 4, 8} |
| 2 | 0 | 12 | 2 | 3 | {0, 4, 8} |
| 3 | 1 | 10 | 4 | 0 | {0, 6} |
| 4 | 1 | 10 | 4 | 0 | {0, 3, 6, 9} |
| 5 | 1 | 10 | 4 | 2 | {0, 3, 6, 9} |
| 6 | 1 | 10 | 4 | 4 | {0, 3, 6, 9} |
| 7 | 1 | 4 | 10 | 0 | {0, 6} |
| 8 | 1 | 4 | 10 | 0 | {0, 3, 6, 9} |
| 9 | 1 | 4 | 10 | 2 | {0, 3, 6, 9} |
| 10 | 1 | 4 | 10 | 4 | {0, 3, 6, 9} |
| 11 | 1 | 0 | 14 | 0 | {0, 6} |
| 12 | 1 | 0 | 14 | 0 | {0, 3, 6, 9} |
| 13 | 1 | 0 | 14 | 2 | {0, 3, 6, 9} |
| 14 | 1 | 0 | 14 | 4 | {0, 3, 6, 9} |
| 15 | 1 | 0 | 14 |  | {0, 3, 6, 9} |

-------------------------------------------------------------- End CR --------------------------------------------------------------