**3GPP TSG RAN WG1 Meeting #106-e R1-210xxxx**

**August 16th – August 26th, 2021**

**Agenda item: 7.2.2**

**Source: Moderator (vivo)**

**Title: FL summary for NR-U configured grant**

**Document for: Discussion and Decision**

# Introduction

This document summarizes the proposed tdocs/CRs for NRU configured grant.

# Issue# CG-1: CR on DFI for 38.212

In [1], CR for 38.212 is provided on DFI.

TP#1:

-------------------------------------------- start of TP for 38.212 -----------------------------------------------

##### 7.3.1.1.2 Format 0\_1

DCI format 0\_1 is used for the scheduling of one or multiple PUSCH in one cell, or indicating CG downlink feedback information (CG-DFI) to a UE.

The following information is transmitted by means of the DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI or SP-CSI-RNTI or MCS-C-RNTI:

- Identifier for DCI formats – 1 bit

- The value of this bit field is always set to 0, indicating an UL DCI format

- Carrier indicator – 0 or 3 bits, as defined in Clause 10.1 of [5, TS38.213].

- DFI flag – 0 or 1 bit

- 1 bit if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by CS-RNTI and for operation in a cell with shared spectrum channel access. For a DCI format 0\_1 with CRC scrambled by CS-RNTI, the bit value of 0 indicates activating or releasing type 2 CG transmission and the bit value of 1 indicates CG-DFI. For a DCI format 0\_1 with CRC scrambled by C-RNTI/SP-CSI-RNTI/MCS-C-RNTI and for operation in a cell with shared spectrum channel access, the bit is reserved.

- 0 bit otherwise;

<unchanged part omitted>

-------------------------------------------------END OF TP-----------------------------------------------------------

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# Issue# CG-2: CR on CG-UCI for 38.212

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6.2.7 Data and control multiplexing

< Unchanged part is omitted >

If frequency hopping is configured for the PUSCH,

- denote  as the OFDM symbol index of the first OFDM symbol after the first set of consecutive OFDM symbol(s) carrying DMRS in the first hop;

- denote  as the OFDM symbol index of the first OFDM symbol after the first set of consecutive OFDM symbol(s) carrying DMRS in the second hop.

- denote  as the OFDM symbol index of the first OFDM symbol that does not carry DMRS in the first hop;

- denote  as the OFDM symbol index of the first OFDM symbol that does not carry DMRS in the second hop;

- if HARQ-ACK is present for transmission on the PUSCH with UL-SCH or if both HARQ-ACK and CG-UCI are present on the same PUSCH with UL-SCH, let

-  and ;

- if CSI is present for transmission on the PUSCH with UL-SCH, let

- ;

- ;

- ; and

- ;

- if CG-UCI is present for transmission on the PUSCH with UL-SCH and without HARQ-ACK, let

- $G^{CG-UCI}\left(1\right)=N\_{L}∙Q\_{m}∙\left⌊{G^{CG-UCI}}/{\left(2∙N\_{L}∙Q\_{m}\right)}\right⌋$ and $G^{CG-UCI}\left(2\right)=N\_{L}∙Q\_{m}∙\left⌈{G^{CG-UCI}}/{\left(2∙N\_{L}∙Q\_{m}\right)}\right⌉$

- if only HARQ-ACK and CSI part 1 are present for transmission on the PUSCH without UL-SCH, let

- ;

- ;

- ; and

- ;

- if HARQ-ACK, CSI part 1 and CSI part 2 are present for transmission on the PUSCH without UL-SCH, let

- ;

- ;

- if the number of HARQ-ACK information bits is more than 2,; otherwise, 

- ;

-  if the number of HARQ-ACK information bits is no more than 2, and  otherwise; and

-  if the number of HARQ-ACK information bits is no more than 2, and  otherwise;

- if CSI part 1 and CSI part 2 are present for transmission on the PUSCH without UL-SCH, let

- ;

- ;

- ; and

- ;

- let , and denote ,  as the number of OFDM symbols of the PUSCH in the first and second hop, respectively;

-  is the number of transmission layers of the PUSCH;

-  is the modulation order of the PUSCH;

- ;

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- .

< Unchanged part is omitted >

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# Issue# CG-4: CR on HARQ-ACK for PUSCH

-------------------------------------------- start of TP for 38.213 -----------------------------------------------

## 10.5 HARQ-ACK information for PUSCH transmissions

A UE can be configured a number of search space sets to monitor PDCCH for detecting a DCI format 0\_1 with a DFI flag field and CRC scrambled with a CS-RNTI provided by *cs-RNTI*. The UE determines that the DCI format provides HARQ-ACK information for PUSCH transmissions based on when a DFI flag field value is set to '1', if a PUSCH transmission is configured by *ConfiguredGrantConfig*.

The HARQ-ACK information corresponds to transport blocks in PUSCH transmissions for all HARQ processes for a serving cell of a PDCCH reception that provides DCI format 0\_1 or, if DCI format 0\_1 includes a carrier indicator field, for a serving cell indicated by a value of the carrier indicator field.

For a PUSCH transmission configured by *ConfiguredGrantConfig*, HARQ-ACK information for a transport block of a corresponding HARQ process number is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission, or of any repetition of the PUSCH transmission, by at least a number of symbols provided by *cg-minDFI-Delay*.

For an initial transmission by a UE of a transport block in a PUSCH configured by *ConfiguredGrantConfig*, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

For a PUSCH transmission scheduled by a DCI format, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

For a PUSCH transmission scheduled by a DCI format, HARQ-ACK information for a transport block of a corresponding HARQ process number is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission by at least a number of symbols provided by *cg-minDFI-Delay* or, if the PUSCH transmission is over multiple slots,

- after a last symbol of the PUSCH transmission in a first slot from the multiple slots by at least a number of symbols provided by *cg-minDFI-Delay*, if a value of the HARQ-ACK information is ACK.

- after a last symbol of the PUSCH transmission in a last slot from the multiple slots by at least a number of symbols provided by *cg-minDFI-Delay*, if a value of the HARQ-ACK information is NACK.

UE does not expect to be configured with different *cg-minDFI-Delay-r16* among multiple *ConfiguredGrantConfig* in one BWP.

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# Issue# CG-5: discussion on frequency hopping for multi-PUSCH

There are 2 tdocs [4][5] discussing frequency hopping for multi-PUSCH, one proposes to clarify, another proposes a CR for 38.214.

**Proposal 1: Clarify that intra-slot frequency hopping is applicable to multi-PUSCH scheduling, while inter-slot frequency hopping is not applicable to multi-PUSCH scheduling.**

-------------------------------------------- start of TP for 38.214 -----------------------------------------------

6.3.1 Frequency hopping for PUSCH repetition Type A

For PUSCH repetition Type A (as determined according to procedures defined in Clause 6.1.2.1 for scheduled PUSCH, or Clause 6.1.2.3 for configured PUSCH), a UE is configured for frequency hopping by the higher layer parameter *frequencyHoppingDCI-0-2* in *pusch-Config* for PUSCH transmission scheduled by DCI format 0\_2, and by *frequencyHopping* provided in *pusch-Config* for PUSCH transmission scheduled by a DCI format other than 0\_2*,* and by *frequencyHopping* provided in *configuredGrantConfig* for configured PUSCH transmission. One of two frequency hopping modes can be configured:

- Intra-slot frequency hopping, applicable to single slot and multi-slot PUSCH transmission and multiple PUSCH transmissions scheduled by a DCI.

- Inter-slot frequency hopping, applicable to multi-slot PUSCH transmission.

In case of resource allocation type 2, the UE transmits PUSCH without frequency hopping.

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# Reference

[1]. R1-2106509, Correction on DFI flag in DCI format 0-1 in TS38.212, Huawei, HiSilicon

[2]. R1-2106518, Corrections on CG-UCI multiplexing in TS38.212, Huawei, HiSilicon

[3] [R1-2107233](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_106-e/Docs/R1-2107695.zip), Draft CR on HARQ-ACK for PUSCH, OPPO

[4]. [R1-2107695](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_106-e/Docs/R1-2107695.zip), Correction on frequency hopping for multi-PUSCH scheduling with single DCI, Ericsson Inc.

[4]. [R1-2107976](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_106-e/Docs/R1-2107976.zip), Discussion on frequency hopping for multi-PUSCH scheduling, vivo