**3GPP TSG RAN WG1 Meeting #107-e R1-21xxxxx**

**e-Meeting, Nov 11th – Nov 19th, 2021**

**Agenda Item: 6**

**Source: Moderator (Nordic Semiconductor ASA)**

**Title: Moderator summary on 107-e-LTE-6CRs-02**

**Document for: Discussion and Decision**

# Introduction

This documents provides the summary of discussions on the corresponding email discussion, regarding the proposed CR in [1].

[107-e-LTE-6CRs-02] Email discussion/approval on Fallback DCI for eMTC – Karol (Nordic)

* Discussion and decision on CR by 11/17, final check by 11/19

# Discussion

In [1], a correction to the DCI Format 6-0A is proposed due to the following reason:

|  |  |
| --- | --- |
| ***Reason for change:*** | Clarify that all UE-specific RRC-configured UL DCI format fields are only present in USS. |
|  |  |
| ***Summary of change:*** | Add the clarification “and the DCI is mapped onto the UE-specific search space given by the C-RNTI as defined in [3]” to Resource block assignment DCI field in 6-0A. |
|  |  |
| ***Consequences if not approved:*** | Size of CSS fallback DCI changes with RRC configuration. |

The proposed change is as following:

##### 5.3.3.1.10 Format 6-0A

DCI format 6-0A is used for the scheduling of PUSCH in one UL cell, and for the indication of ACK feedback.

The following information is transmitted by means of the DCI format 6-0A:

- Flag format 6-0A/format 6-1A differentiation – 1 bit, where value 0 indicates format 6-0A and value 1 indicates format 6-1A

- Frequency hopping flag – 1 bit, where value 0 indicates frequency hopping is not enabled and value 1 indicates frequency hopping is enabled as defined in clause 5.3.4 of [2]

- Number of resource units – 2 bits, where value '00' indicates the format 6-0A DCI uses PRB resource allocation, otherwise the DCI format 6-0A uses sub-PRB resource allocation as defined in clause 8.1.6 of [3]. This field is present when *ce-PUSCH-SubPRB-Config* is configured by higher layers and the DCI is mapped onto the UE-specific search space given by C-RNTI as defined in [3]

- Resource block assignment –

- If the format 6-0A DCI uses sub-PRB resource allocation and the DCI is mapped onto the UE-specific

search space given by C-RNTI as defined in [3]:

- +6 bits for PUSCH as defined in [3]

-  MSB bits provide the narrowband index as defined in clause 5.2.4 of [2]

- 6 bits provide the resource allocation within the indicated narrowband using UL resource allocation type 5 as defined in clause 8.1.6 of [3]

- Else if the DCI is mapped onto the UE-specific search space given by C-RNTI as defined in [3] and flexible starting PRB for PUSCH resource allocation is enabled by higher layers with  equal to , $\left⌈log\_{2}(6N\_{RB}^{UL})\right⌉$ bits for FDD PUSCH and $\left⌈log\_{2}(5N\_{RB}^{UL})\right⌉$ bits for TDD PUSCH provide the resource allocation using UL resource allocation type 0 as defined in clause 8.1.1 of [3]

- Otherwise,+5 bits for PUSCH as defined in [3]:

- If the 5 LSB bits indicate a value not larger than 20

-  MSB bits provide the narrowband index as defined in clause 5.2.4 of [2]

- 5 bits provide the resource allocation using UL resource allocation type 0 within the indicated narrowband

- Otherwise,

- +5 bits provide the resource allocation using UL resource allocation type 4 as defined in clause 8.1.5 of[ 3]

<remaining parts of clause have been omitted >

According to moderator calculations, the number of bits needed for resource block assignment in DCI Format 6-0A are as shown in the Table 1 below:

**Table 1:** Number of bits of ”Resource block assigment ” -field in DCI Format 6-0A

|  |  |  |
| --- | --- | --- |
| System bandwidth | N of bits of RA w/o flex PRB | N of bits of RA w flex PRB for FDD |
| 1.4 MHz | 5 | 6 |
| 3 MHz | 6 | 7 |
| 5 MHz | 7 | 8 |
| 10 MHz | 8 | 9 |
| 15 MHz | 9 | 9 |
| 20 MHz | 9 | 10 |

**Q1**: Is it clear in current specification that when *ce-PUSCH-SubPRB-Config* is not configured by higher layers then the DCI format 6-0A in CSS follows Resource block assignment

Otherwise,+5 bits for PUSCH as defined in [3]:

- If the 5 LSB bits indicate a value not larger than 20

-  MSB bits provide the narrowband index as defined in clause 5.2.4 of [2]

- 5 bits provide the resource allocation using UL resource allocation type 0 within the indicated narrowband

- Otherwise,

- +5 bits provide the resource allocation using UL resource allocation type 4 as defined in clause 8.1.5 of[ 3]

|  |  |
| --- | --- |
| Companies | Comments |
| Ericsson | The current specification says that the Resource block assignment follows the “Otherwise” case unless “sub-PRB allocation is used” or “flexible starting PRB is enabled”. Whether “sub-PRB allocation is used” or not depends on the value of the ‘Number of resource units’ field. Perhaps the text is clear enough already, although we might be open to a further clarification of the text. |
| Qualcomm | No.If sub-PRB is not configured, then the 1st “IF” will be false (uses sub-PRB resource allocation), but the next IF (“flexible starting PRB for PUSCH resource allocation is enabled by higher layers”) may still be true.In summary, we think the 1st change is not needed, but the 2nd one is. |
| Nokia, NSB | Agree with Qualcomm, 1st change doesn’t appear to be needed, but 2nd one is. |

**Q2:** Is it a common understanding, that according to current specification, when flexible starting PRB for PUSCH resource allocation is enabled by higher layers the DCI format 6-0A in CSS will change its size and/or its interpretation (as in Table 1)?

|  |  |
| --- | --- |
| Companies | Comments |
| Ericsson | Yes, it seems so. |
| Qualcomm | Yes |
| Nokia, NSB | Yes |

**Q3:** Do you agree that size and/or interpretation of DCI format 6-0A in CSS should not depend on UE-specific RRC configuration? If yes, also please indicate whether below change is acceptable?

Else if the DCI is mapped onto the UE-specific search space given by C-RNTI as defined in [3] and flexible starting PRB for PUSCH resource allocation is enabled by higher layers with  equal to , $\left⌈log\_{2}(6N\_{RB}^{UL})\right⌉$ bits for FDD PUSCH and $\left⌈log\_{2}(5N\_{RB}^{UL})\right⌉$ bits for TDD PUSCH provide the resource allocation using UL resource allocation type 0 as defined in clause 8.1.1 of [3]

|  |  |
| --- | --- |
| Companies | Comments |
| Ericsson | Yes, it seems reasonable to us that the size is always given by the “Otherwise” case for CSS. This seems to be in line with what we have typically agreed for other features that modify the DCI size. The earlier agreements for this feature (see e.g. the RAN1/2/3/4 agreements in [R1-1807971](http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_93/Docs/R1-1807971.zip), the L1 parameters in [R1-1807861](http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_93/Docs/R1-1807861.zip), and the WI summary in [RP-182592](http://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_82/Docs/RP-182592.zip)) don’t seem to say anything about CSS. But this sort of thing has often been fixed with maintenance CRs long after the WI ended.Regarding the text proposal, perhaps the following would be more readable:Else if flexible starting PRB for PUSCH resource allocation is enabled by higher layers with  equal to  and the DCI is mapped onto the UE-specific search space given by C-RNTI as defined in [3], $\left⌈log\_{2}(6N\_{RB}^{UL})\right⌉$ bits for FDD PUSCH and $\left⌈log\_{2}(5N\_{RB}^{UL})\right⌉$ bits for TDD PUSCH provide the resource allocation using UL resource allocation type 0 as defined in clause 8.1.1 of [3]It might be good to check whether there are other parts of 36.211, 36.212 and 36.213 that might be affected, if we want to clarify that the behavior differs between USS and CSS for this feature. |
| Qualcomm | Yes |
| Nokia, NSB | Yes – proposed text is acceptable to us. |

# Summary

TBA

# References

1. R1-2112378 Fallback DCI for eMTC, Nordic Semiconductor ASA