**3GPP TSG RAN WG1 #100bis R1-200xxxx**

**e-Meeting, April 20th – 30th, 2020**

Source: moderator (vivo)

Title: Feature lead summary NRU-CG-01

Agenda Item: 7.2.2.2.4

Document for: Discussion and Decision

1. Introduction

Following email thread is assigned:

[100b-e-NR-unlic-NRU-CG-01] Email discussion/approval on following issues by 4/23; if necessary, followed by endorsing the corresponding TPs by 4/28 – Rakesh (Vivo)

* RRC value ranges for RRC parameters
* Correction related to semiPersistentOnPUSCH
* Clarification on offset-r16
* TP on CG-UCI transmission

1. Discussion on topic#1
   1. Issue 1: RRC value ranges for multiple RRC parameters

## 2.1.1 a) Values for CP extension

*The values supported for duration of the CP extension prior to a CG-PUSCH are 0, 11, 20, 29, 38, 47, and 56 us.*

or

*the set of starting offset can be {16, 25, 34, 43, 52, 61, OS #1} for 15 kHz SCS and the specific starting position and the duration of CP extension for 30 kHz and 60 kHz should be further studied*

*or*

*the set of starting offset is* Toffset = *{*16, 25, 34, 43, 52, 61, }*, and the CP extension is calculated as*

- Toffset

where for .

Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | We are fine with the proposal |
| Huawei, HiSilicon | We support calculation of the CPE as  - Toffset  where for , for accuracy and consistency with scheduled UL |
| Intel | Taking in mind that i) in NR-U the starting position offsets are not necessarily applied within symbol #0, ii) multiple subcarrier spacings are supported, and iii) the first OFDM symbol in each half of a subframe is always slightly longer than the rest of the OFDM symbols, in order to make sure that a 16us and 25us gaps are always accurately guaranteed and offset values with a minimum 9us granularity are chosen, we prefer option 3:  - Toffset  where for respectively, while Toffset is composed by the set {16, 25, 34, 43, 52, 61, }. |
| LG | For consistency with scheduled PUSCH/PUCCH, we support the third proposal. |
| Lenovo,  Motorola Mobility | We support using equation like below:  *the set of starting offset is* Toffset = *{*16, 25, 34, 43, 52, 61, }*, and the CP extension is calculated as*  - Toffset  where for . |
| Samsung | We are supportive with the third proposal to have a consistency |
| Nokia, NSB | It seems all three proposals are very similar in spirit. The 3rd proposal seems to be the (most) complete one, so we can take that as a basis for the TP.  One point is that in the previous meeting we agreed to put in the RRC spec just the indices for the starting point rather the actual starting points. As for the TP, our preference is to describe the CP extension starting points and related equations in 38.211, while 38.214 describes the procedure for selecting a particular starting point. |

## 2.1.2 b) Value range of X, D, O

RAN1 to agree on value range of X for the case of *ULtoDL-CO-SharingED-Threshold-r16* is not configured, and number of combinations of D, O, CAPC for the case of *ULtoDL-CO-SharingED-Threshold-r16* is configured.

* X is integer multiple of 14 or any positive integer.
* The maximum value of X and D as well as O is limited to the duration of MCOT

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For the RRC parameters duration-r16 and offset-r16, the maximum configurable value is (the total number of slots in the MCOT corresponding to the maximum p and μ)-1=23 slots.

duration-r16 INTEGER (1..23),

offset-r16 INTEGER (1..23),

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To generate one row in the configured table indicating that the COT sharing information is not available, channelAccessPriority-r16=0 is provided by the corresponding parameter CG-COT-Sharing-r16 and the gNB disregards any values of duration-r16 and offset-r16 provided in that row.

* The value range of the parameter channelAccessPriority-r16 should be changed fromINTEGER (1..4) ***to*** INTEGER (0..4).

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Accounting for the maximum number of combinations of *(O, D)* per CAPC for *µ=2,*

The Value range for the parameter cg-COT-SharingList-r16 should be changed as follows:

cg-COT-SharingList-r16 SEQUENCE (SIZE (1..701)) OF CG-COT-Sharing-r16

If configuring additional rows in the table to indicate possible UL-burst-end points in a slot is supported (**See Issue 3**):

* cg-COT-SharingList-r16 SEQUENCE (SEQUENCE (SIZE (1..701)) OF CG-COT-Sharing-r16, SEQUENCE (SIZE (1..11)) OF ulBurstEnd-r16)

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For the RRC parameter cg-COT-SharingOffset-r16, the value of X should support 4ms offset duration in symbols assuming the largest SCS, i.e., X= 4 \* 4 \* 14 = 224 symbols

Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | The suggested fffValues (23 and 701) are based on the maximum duration of MCOT as 6ms. But we noticed that in the CAPC table for UL, there are two notes which may introduce even larger duration. So we think the values should be revisited based on 10ms duration of MCOT.  NOTE1: For , if the higher layer parameter *absenceOfAnyOtherTechnology-r14* or *absenceOfAnyOtherTechnology-*r16 is provided, otherwise, .  NOTE 2: When it may be increased to by inserting one or more gaps. The minimum duration of a gap shall be . The maximum duration before including any such gap shall be .  For the indication of the COT sharing information that is not available, rather than changing the value range of CAPC, we prefer to use a specific row index (e.g. the first row or the last row) in *cg-COT-SharingList-r16* to indicate that the COT sharing is not available.  Maybe we can list all the alternatives and ask RAN2 to decide. |
| Huawei, HiSilicon | In principle, the FFS value ranges can be calculated based on for . However, it should also be noted that for DL-UL COT sharing in FeLAA using DCI Format 1C, the value range for *l* and *d* is up to 6ms out of for , despite the fact that is also applicable if the absence of any other technology sharing the channel can be guaranteed on a long term basis. These combinations of *l* and *d* are not RRC configured though.  For the row indicating COT sharing is not available, it should be noted that each row of the table is of type *CG-COT-Sharing-r16* which is currently defined as a combination of the three parameters as follows  CG-COT-Sharing-r16 ::= SEQUENCE {  duration-r16 INTEGER (1..ffsValue),  offset-r16 INTEGER (1..ffsValue),  channelAccessPriority-r16 INTEGER (1..4)  }  So, based on that definition, any row we pick for disabling COT sharing would have to correspond to at least one invalid value for one of these parameters. Therefore, we think it is quite intuitive to use CAPC=0 regardless of O and D since gNB cannot multiplex traffic of the same or higher CAPC value.  For the RRC parameter *cg-COT-SharingOffset-r16*, the value of X could maintain the same maximum value used for AUL (4ms). We are also fine with X following the same value range for O and D. |
| Intel | We have following concerns:   1. the maximum set of values that the duration and offset can assume should be aligned with the maximum MCOT supported, which is 10 ms in case the absence of other technology can be guaranteed. Therefore, the longest duration or offset should be 39 slots and not 23; 2. As to indicate when the remaining COT is not shared, we could reserve a combination of duration and offset values, which are not feasible (e.g., offset and duration equal to 9ms), without having to change the CAPC range. |
| LG | For value of X, the same value (i.e., 4ms) as in AUL can be reused or following the same value range for O and D. The maximum configurable value for the RRC parameters such as duration-r16, offset-r16 and cg-COT-SharingList-r16 should be defined based on the maximum duration of MCOT (i.e., 10ms) in Table 4.2.1-1 of 37.213. |
| Lenovo,  Motorola Mobility | We have following comments:   1. For value of X, we prefer same value of 4ms agreed in LTE FeLAA can be reused. 2. For maximum configurable value of O and D, MCOT with 10ms duration is considered. Meanwhile, we also need to exclude the first slot since at least the first slot in the MCOT is used to transmit CG-PUSCH instead for COT sharing. E.g., for 15kHz SCS with 10ms MCOT, at least the first slot in the 10 slots is used to transmit CG-PUSCH and CG-UCI. That is to say, maximum 9 slots can be shared to gNB. Consequently, the maximum duration is 9 slots for 15kHz SCS, which can be used to determine the maximum configurable value of D. 3. For the non-available indication of COT sharing in CG-UCI, we prefer a dedicated row in the CG-COT sharing list for non-available COT sharing indication. |
| Samsung | For the maximum configurable value of duration-r16 and offset-r16, we prefer to determine values based on the maximum MCOT value that the system can support.  To indicate that the COT sharing information is not available, we think the simplicity way is to use the specific row index.  Regarding the value of X, we tend to support to follow the same value range for O and D for NR-U, but the same value with AUL is also fine. |
| Nokia, NSB | Our preferences is to define the value ranges for duration-r16 and offset-r16, as well as X so that maximal COT lengths can be supported |

* 1. Issue 10: Correction related to semiPersistentOnPUSCH (Editorial/clarification)

### 2.10.1 TP1

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9 UE procedure for reporting control information

< Unchanged parts are omitted >

If a UE would multiplex HARQ-ACK information in a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, ~~or in an activated PUSCH transmission configured by~~ *~~semiPersistentOnPUSCH~~*~~,~~ and includes CG-UCI [5, TS 38.212], the UE multiplexes the HARQ-ACK information in the PUSCH transmission if the UE is provided *cg-CG-UCI-Multiplexing*; otherwise, the UE does not transmit the PUSCH and multiplexes the HARQ-ACK information in a PUCCH transmission or in another PUSCH transmission.

< Unchanged parts are omitted >

9.3 UCI reporting in physical uplink shared channel

< Unchanged parts are omitted >

For a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, ~~or for an activated PUSCH transmission that is configured by~~ *~~semiPersistentOnPUSCH~~*~~,~~ and includes CG-UCI, the UE is provided by *betaOffsetCG-UCI-r16* a value, from a set of values, with the mapping defined in Table 9.3-1. If the UE multiplexes HARQ-ACK information in the PUSCH transmission, as described in Clause 9.2.5, the UE jointly encodes the HARQ-ACK information and the CG-UCI [5, TS 38.212] and determines a number of resources for multiplexing the combined information in a PUSCH using .

< Unchanged parts are omitted >

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 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 an XYZ field value, as described in [5, TS 38.212], if a PUSCH transmission is configured by *ConfiguredGrantConfig* ~~or is an activated PUSCH transmission configured by~~ *~~semiPersistentOnPUSCH~~*.

The HARQ-ACK information corresponds to transport blocks in PUSCH transmissions for a number of HARQ processes provided by *nrofHARQ-Processes* for a serving cell of a PDCCH reception that provides DCI format 1\_0 or, if DCI format 1\_0 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* ~~or for activated PUSCH transmissions configured by~~ *~~semiPersistentOnPUSCH~~*, 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 a number of symbols provided by *cg-minDFIDelay-r16*.

< Unchanged parts are omitted >

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | We support the proposal |
| Huawei, HiSilicon | We support the proposal |
| Intel | We support this TP. |
| LG | We also support the proposal. |
| Lenovo,  Motorola Mobility | Support FL proposal. |
| Samsung | We support the proposal |
| NSB, Nokia | we support the proposal |

* 1. Issue 11: Clarification on offset-r16 (Editorial/clarification)

Determining the DL starting slot might be misinterpreted as DL starting in slot *n+O+1,* e.g. when *O=1,* which is inconsistent with the use of other COT sharing offsets (*n+O*)

### 2.11.1 TP1

TP for 37.213 section 4.1.3

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If the 'COT sharing information' in CG-UCI detected in slot *n* indicates a row index that corresponds to a *CG-COT-Sharing-r16* that provides channel occupancy sharing information, the gNB can share the UE channel occupancy assuming a channel access priority class *p=channelAccessPriority-r16*, starting from slot *n+O where O=offset-r16* slots, for a duration of *D=duration-r16* slots where *duration-r16*, *offset-r16* and *channelAccessPriority-r16* are higher layer parameters provided by *CG-COT-Sharing-r16*.

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | We are fine with the proposal |
| Huawei, HiSilicon | We support the proposal |
| Intel | We support this clarifying text. It makes the text clearer and removes any possible ambiguities. |
| LG | We support the proposal. |
| Lenovo,  Motorola Mobility | Support this proposal since it makes the standard crystal clear. |
| Samsung | We support the proposal |
| NSB, Nokia | we support the proposal |

* 1. Issue 13: TP on CG-UCI transmission (Editorial/clarification)

### 2.13.1 TP1

TP for 38.213

9.3 UCI reporting in physical uplink shared channel

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<unchanged text omitted>

For a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, or for an activated PUSCH transmission that is configured by *semiPersistentOnPUSCH*~~, and includes CG-UCI~~, the UE includes CG-UCI in the PUSCH if ~~is~~ provided by *betaOffsetCG-UCI-r16* a value, from a set of values, with the mapping defined in Table 9.3-1. If the UE multiplexes HARQ-ACK information in the PUSCH transmission, as described in Clause 9.2.5, the UE jointly encodes the HARQ-ACK information and the CG-UCI [5, TS 38.212] and determines a number of resources for multiplexing the combined information in a PUSCH using .

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | TP1, TP2 and TP4 are addressing the same issue, i.e. every PUSCH transmission for NR-U CG should include CG-UCI. We slightly prefer TP4. |
| Huawei, HiSilicon | Either TP1 or TP2 can be adopted. In case of adopting TP2, “PUSCH transmissions configured by *semiPersistentOnPUSCH”* should be deleted since it is not part of the proposals in section 2.2 |
| Intel | TP1, TP2 and TP4 address the same issue, and we prefer TP4. |
| LG | We slightly prefer TP4 but either TP1 or TP2 also fine. |
| Samsung | We tend to support TP2. |
| NSB, Nokia | we have a slight preference for TP2 |

### 2.13.2 TP2

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beta\_offset indicator field indicates a  value, a  value and a  value from the respective sets of values, with the mapping defined in Table 9.3-3.

For operation with shared spectrum channel access, for CG-PUSCH transmissions configured by *ConfiguredGrantConfig*, or for activated PUSCH transmissions configured by *semiPersistentOnPUSCH*, each CG-PUSCH transmission has an associated CG-UCI and the associated CG-UCI is multiplexed on the CG-PUSCH.

For a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, or for an activated PUSCH transmission that is configured by *semiPersistentOnPUSCH*, and includes CG-UCI, the UE is provided by *betaOffsetCG-UCI-r16* a value, from a set of values, with the mapping defined in Table 9.3-4. If the UE multiplexes HARQ-ACK information in the PUSCH transmission, as described in Subclause 9.2.5, the UE jointly encodes the HARQ-ACK information and the CG-UCI [5, TS 38.212] and determines a corresponding value as TBD.

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | TP1, TP2 and TP4 are addressing the same issue, i.e. every PUSCH transmission for NR-U CG should include CG-UCI. We slightly prefer TP4. |
| Huawei, HiSilicon | Either TP1 or TP2 can be adopted. In case of adopting TP2, “PUSCH transmissions configured by *semiPersistentOnPUSCH”* should be deleted since it is not part of the proposals in section 2.2 |
| Intel | TP1, TP2 and TP4 address the same issue, and we prefer TP4. |
| LG | We slightly prefer TP4 but either TP1 or TP2 also fine. |
| Lenovo,  Motorola Mobility | We prefer TP2 since it is quite clear.  TP4 is also fine with us. |
| Samsung | We tend to support TP2. |
| NSB, Nokia | we have a slight preference for TP2 |

### 2.13.3 TP3

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<omitted>

For a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, or for an activated PUSCH transmission that is configured by *semiPersistentOnPUSCH*, and includes CG-UCI, the UE is provided by *betaOffsetCG-UCI-r16* a value, from a set of values, with the mapping defined in Table 9.3-1. If the UE multiplexes HARQ-ACK information in the PUSCH transmission, as described in Clause 9.2.5, the UE jointly encodes the HARQ-ACK information and the CG-UCI [5, TS 38.212] and determines a number of resources for multiplexing the combined information in a PUSCH using where indexes ,, and are used for up to 2, more than 2 and up to 11, and more than 11 combined information bits, respectively.

<Omitted>

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | Fine with the proposal |
| Huawei, HiSilicon | We are fine with this proposal |
| Intel | We support in principle this TP. However, we would prefer to align this text with the rest of the text contained in Sec. 9.3, and revise it as follows:  If the UE multiplexes HARQ-ACK information in the PUSCH transmission, as described in Clause 9.2.5, the UE jointly encodes the HARQ-ACK information and the CG-UCI [5, TS 38.212] and determines a number of resources for multiplexing the combined information in a PUSCH using , which provides indexes ,, and for the UE to use if the UE multiplexes up to 2, more than 2 and up to 11, and more than 11 combined information bits, respectively. |
| LG | When the CG-UCI is jointly encoded with HARQ-ACK, the beta-offset value should be determined among the configured beta-offset values for HARQ-ACK based on the combined payload size of CG-UCI and HARQ-ACK. We are also fine with the text proposed by Intel. |
| Samsung | We are ok with this proposal. |
| NSB, Nokia | we are ok with the proposal |

### 2.13.4 TP4

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< Unchanged parts are omitted >

For a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, and includes CG-UCI, the UE is provided by *betaOffsetCG-UCI-r16* a value, from a set of values, with the mapping defined in Table 9.3-1. If the *cg-RetransmissionTimer* is provided, every PUSCH transmission that is configured by a *ConfiguredGrantConfig* includes CG-UCI. If the UE multiplexes HARQ-ACK information in the PUSCH transmission, as described in Clause 9.2.5, the UE jointly encodes the HARQ-ACK information and the CG-UCI [5, TS 38.212] and determines a number of resources for multiplexing the combined information in a PUSCH using .

< Unchanged parts are omitted >

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | TP1, TP2 and TP4 are addressing the same issue, i.e. every PUSCH transmission for NR-U CG should include CG-UCI. We slightly prefer TP4. |
| Huawei, HiSilicon | Either TP1 or TP2 can be adopted. In case of adopting TP2, “PUSCH transmissions configured by *semiPersistentOnPUSCH”* should be deleted since it is not part of the proposals in section 2.2 |
| Intel | TP1, TP2 and TP4 address the same issue, and we prefer TP4. |
| LG | We slightly prefer TP4 but either TP1 or TP2 also fine. |
| Samsung | We tend to support TP2. |
| NSB, Nokia | we have a slight preference for TP2 |

# References

[1] R1-2002737, Feature lead summary#2 on NRU configured grant enhancement, RAN1#100b-e

[2] R1-2002745, Summary of prep email discussion on NRU-CG, RAN1#100b-e