**3GPP TSG RAN WG1 Meeting #104bis-e R1-200xxxx**

**April 12th – April 20th, 2020**

**Agenda item: 7.2.2**

**Source: Moderator (Qualcomm Incorporated)**

**Title: Preparation phase email discussion for NR-U**

**Document for: Discussion and Decision**

# Introduction

The paper summarizes the preparation phase email discussion for contribution submitted to 7.2.2 on NR-U CR.

# Issues identified

## 2.1 Initial access signals and channels

For initial access signals and channels [1], the following issues have been identified, but it can be captured in IA discussion

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| ~~Init-1~~ | ~~Invalid SSB by SSB positions in burst for FBE~~ | ~~1~~ |
|  |  |  |

FL recommendations

* Captured in IA as well. Discuss it there.

## 2.2 DL signals and channels

For DL signals and channels [2], the following issues have been identified

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| DL-A1 | Maximum size of switchTriggerToAddModList-r16 and switchTriggerToReleaseList-r16 | 1 |
| DL-B1 | Action when an inapplicable value for HARQ-ACK feedback timing is provided in the DCI scheduling the PDSCH (K1=-1) | 1 |
| DL-B2 | Measurement during SCell activation | 4 |
| DL-B3 | CSI measurement across DL bursts | 1 |
| DL-C1 | Processing time for at least l\_d=5 | 2 |
| DL-D1 | Missing description of PDCCH features for shared spectrum in TS38.300 | 1 |
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FL recommendations:

## 2.3 UL signals and channels

For UL signals and channels [3], the following issues have been identified

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| --- | --- | --- |
| **Issue #** | **Issue summary** | **# Contribution(s)** |
| UL-01 | Clarification on DCI size matching rules for DCI 0\_0 | 1 |
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FL recommendations (see further details in [3]): Already discussed multiple times and no consensus to change.

## 2.4 Channel access

For channel access [4], the following issues have been identified

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| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| CA-1 | Clarifying the conditions for indicating Type 2 LBT for wideband scheduled PUSCH | 1 |
| CA-2 | China-specific aspects related to CCA time and gaps | 1 |
| CA-3 | Correction to SR reporting due to consistent LBT failure recovery | 1 |
| CA-4 | Clarifications on applicability of Type 2A DL Channel Access | 2 |
| CA-5 | UL contention window adjustment procedures | 1 |
| CA-6 | DL COT Detection in Semi-static Channel Access | 1 |
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FL recommendations:

## 2.5 Initial access procedures

For initial access procedures [5], the following issues have been identified

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| IA 2-1 | PDSCH rate matching over SSB partially overlapping with idle | 1 |
| IA 3-1 | Terminology clarification for “operation” | 1 |
| IA 3-2 | MsgA PUSCH in FBE idle | 1 |

## 2.6 HARQ enhancements

For HARQ enhancements [6], the following issues have been identified

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| Type3CB#1 | Type-3 HARQ-ACK codebook size ambiguity | 2 |
| Type3CB#2 | Correction on multiplexing timeline definition for Type-3 HARQ-ACK codebook | 4 |
| Type2CB#3 | Assumption on NFI value for a PDSCH group not received at UE side when the UL DAI indicates a value not equal to 4 for that group | 1 |
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FL recommendations:

* Type2CB#3 discussed before

## 2.7 CG enhancements

For CG enhancements [7], the following issues have been identified

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| CG-1 | Freq hopping for NR-U CG | 1 |
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FL recommendations:

## 2.8 Wideband operation

On wideband operation enhancements, no issue identified.

# Preparation phase discussion

We have identified many issues and we have limited email thread to discuss them. In the next tables, please provide your view on issues with the following notations

* “Y” if you believe the issue is important and needs email discussion
* “E” if you believe the issue is agreeable but editorial in nature. Potentially we can take all the editorial issues out for a separate fast track email approval.
* Empty if you believe the issue is not necessary to fix or low priority

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Company | DL-A1 | DL-B1 | DL-B2 | DL-B3 | DL-C1 | DL-D1 | UL-01 |
| Ericsson | Y |  | Y |  |  | E |  |
| LG | Y |  | Y | E |  | E |  |
| Samsung | Y |  | Y |  |  |  |  |
| Sharp |  |  | Y |  |  |  |  |
| Nokia, NSB | Y/E |  | Y | E |  | E |  |
| Apple | Y |  | Y | E |  | E |  |
| WILUS | Y |  | Y | E |  | E |  |
| Spreadtrum | Y |  | Y | E |  | E |  |
| vivo | Y |  | Y | E |  | E |  |
| ZTE | Y |  | Y | E |  | E |  |
| Huawei |  | Y | Y |  | Y | E |  |
| Qualcomm |  |  | Y | E | Y | E |  |

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| --- | --- | --- | --- | --- | --- | --- |
| Company | CA-1 | CA-2 | CA-3 | CA-4 | CA-5 | CA-6 |
| Ericsson | Yes | **No.**  Longer sensing always possible due to e.g. implementation or regional regulatory | Yes | Yes | -  Agree w FL recommendation | **No.**  CR is not correct. UE can detect DL anywhere in COT. |
| Samsung | Y |  |  | Y |  |  |
| Sharp |  |  | Y | Y |  |  |
| DOCOMO | Y |  | Y | Y |  |  |
| Nokia, NSB | Y |  | Y | Y |  | Y |
| Apple | Y |  | Y | Y |  |  |
| WILUS | Y |  | Y | Y |  |  |
| Spreadtrum | Y |  | Y | Y |  |  |
| vivo | Y | Y | Y | Y |  |  |
| ZTE | Y | Y | Y | Y |  |  |
| Huawei | Yes | Yes | Yes | Yes | Yes | No  Incorrect as Ericsson commented |
| LG | Y |  | Y | Y | Y | No, agree with Ericsson’s comments. |
| Qualcomm | Y |  | Y | Y |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Company | IA 2-1 | IA 3-1 | IA 3-2 | Type3CB#1 | Type3CB#2 | Type2CB#3 | CG-1 |
| Ericsson |  |  | E | Yes | Yes | - | - |
| Samsung |  |  | E | Y | E |  |  |
| Sharp | Y |  | Y | Y | E |  |  |
| Nokia, NSB |  |  | Y | Y | Y |  |  |
| Apple | Y |  | E | Y | Y |  |  |
| WILUS |  |  | Y | Y | Y |  |  |
| Spreadtrum |  |  | Y | Y | Y |  |  |
| vivo |  |  | E | Y | Y |  | Y |
| ZTE |  |  | E | Y | E |  |  |
| Huawei |  |  | E | Yes | Yes |  |  |
| LG |  |  |  | Y | Y | Y |  |
| OPPO |  | Y |  | Y |  |  |  |
| Qualcomm | Y | Y | E | Y | Y |  |  |

Please provide additional company views below

|  |  |
| --- | --- |
| **Company** | **View** |
| Ericsson | Regarding **DL-B1**, we don't think this is a valid scenario. The point of specifying the MAC action times in 38.214 (e.g., activation/deactivation of sp-CSI reporting, SCell activation/deactivation, TCI state activation, etc., etc.) is to that there can be aligned understanding between gNB and UE on exactly when the MAC actions are applied. It is in the gNB's interest to know this precisely, hence it does not make sense that for important PDSCH transmissions carrying such MAC-CEs that the gNB would also choose to indicate NNK1. Rather, the gNB should schedule in a way that it is able to indicate a valid K1. With this understanding, there is no need for a spec change. Moreover, this is quite a large spec change.  Regarding **DL-B3**, we are okay with the (editorial) correction of the typo ('PDDCH' 🡺 'PDCCH'); however, we don't agree with the rest of the TP. We don't agree that the current spec text can be interpreted that there could be a gap between two sets of symbols. According to the current spec text, there is only one set of symbols, and the "instances" (note the plurality) of the p/sp-CSI-RS occur "in a set of symbols" (note the singularity). The spec text then says that if this set of symbols is not all occupied by one or more PDSCHs and/or one or more CSI-RS(s), then the UE is not allowed to average across the instances of the p/sp-CSI-RS resources. Hence, the current spec text is in line with the agreement on which it is based.  Regarding **IA 3-1**, there are many instances of the phrase "for operation with shared spectrum channel access," and it is already clear what this means. It applies to the case when any one or more of the cells on which the UE is configured to transmit/receive is in shared spectrum. We do not need to clarify for every use of this phrase exactly which cell is in shared spectrum.  Regarding **IA 3-2**. We agree that this correction is needed. A similar correction was made some time ago in Section 8.1 for PRACH occasion validation, and the same applies for a PUSCH occasion for 2-step RACH. This should be easy to agree as an editorial correction. |
| LG | For **DL-B3**, there are 3 corrections.   * Clarification of “a set of symbols”: At least Ericsson seems to have a view that “a set of symbols” corresponds to symbols without any gaps in between. However, we understand that “a set of symbols” can be discontinuous. Different understanding between companies should be resolved. * For cross-carrier triggering/scheduling, triggering/scheduling DCI cannot affect P/SP-CSI-RS validation. * Typo: PDDCH 🡪 PDCCH   To deal with above issues, it should be handled by email discussion, but seems to fall into ‘editorial’ category in nature. |
| Samsung | For IA 3-1, we think if a cell either of DL or UL is operated in unlicensed, UE should regard this as operation with shared spectrum. |
| Sharp | Regarding **UL-01**, the issue doesn’t occur since the size of FDRA field in DCI format 0\_0 is determined based on active UL BWP in a case of interlace scheduling.  Regarding **IA 3-1**, the spec. is clear enough. The UE determines whether or not the serving cell is “for operation in a cell with shared spectrum channel access” or not by referring to PCell even when the UE transmits a PRACH in a SCell. However, if companies have different understanding, we are OK to discuss.  Regarding **CA-6**, we understand the intention, however it is too late to change Rel-16 behaviours for forward compatibility. Backward compatibility has to be ensured by Rel-17 if necessary. |
| Nokia, NSB | For **CA-2**, the change seems to imply that the existing equipment (e.g. LAA and Wi-Fi is not compliant anymore. We would like to first study the related regulation to see isf this was really intended. In that respect, a reference to the updated regulation would be useful.  For **CA-6**, we feel that the companies may not have understood the motivation correctly, so let me reiterate it here:   * According to the current specs, a Rel-16 UE may assume that any DL transmission occurs in a gNB initiated FFP/COT, which as such is correct up to Rel-16. * However, we have agreed to introduce UE initiated FFP, and UE-gNB COT sharing in the Rel-17 WI on URLLC enhancements. Once UE-gNB COT sharing is enabled, a Rel-16 UE may erroneously assume that a COT initiated by another UE is a gNB initiated COT. * To avoid this, we propose to limit the gNB FFP detection to the start of the gNB COT only. Note that it is too late to address this in Rel-17 since the Rel-16 UEs will already have a different understanding.   One might rightfully argue that this change is actually triggered by the Rel-17 WI, and should be treated there. However, as described above, the Rel-16 UE will already see the issue, and hence it is preferred to solve this as soon as possible before there are issues in the field. |
| Apple | On **DL-B2**, there was extensive discussion in the RAN1 104-e meeting. The divergence has been clearly identified regarding the interpretation of one sentence ‘PDCCH monitoring for the SCell’ in current TS 38.321. One way, if not the only one, is to send LS to RAN2 to ask for clarification as already proposed by some companies. Otherwise, we see very little chance to make progress on this issue if companies still hold their own interpretations.  For **DL-B3**, we support LG view and prefer to make specification more clear. |
| vivo | On **CG-1**, current spec is not clear on whether to support frequency hopping for NRU configured PUSCH with non-interlace resource allocation.  Since CG belongs to repetition type A according to section 6.1.2.3.1 in TS 38.214, the application of frequency hopping should refer to section 6.3.1 in TS 38.214 as below:  - Intra-slot frequency hopping, applicable to single slot and multi-slot PUSCH transmission.  - Inter-slot frequency hopping, applicable to multi-slot PUSCH transmission.  Single slot and multi-slot PUSCH are clear for NR Rel-15 PUSCH. But for NR Rel-16, the new type of PUSCH is introduced by multi-PUSCH scheduling and NRU configured grant PUSCH. There are the following types of PUSCH transmission:   * Type 1: a PUSCH within multiple PUSCHs scheduled by one single DCI; * Type 2-1: a PUSCH within multiple PUSCHs by one configured grant with repK=1; * Type 2-2: a PUSCH within multiple PUSCHs by one configured grant with repK>1 (especially repK PUSCHs span multiple slots).   The definition of single slot and multi-slot is not clear so that whether type 1/2-1/2-2 PUSCH belongs to single slot or multi-slot PUSCH transmission is not clear. In this sense, how to apply the frequency hopping for these Type 1/2-1/2-2 PUSCHs is not clear and could have different understanding. This should be discussed to make it clear. Besides, it could also help the discussion and understanding in multi-PUSCH scheduling in Rel-17 52.6GHz WI. |
| Huawei, HiSilicon | Issue **CA-3** may be better discussed under UL channels? |
| LG #2 | Regarding **UL-01**, it is true that this issue was low priority in previous meetings, so it has not been treated in e-mail discussion. For this reason, there was no time to discuss on whether this change is necessary or not.  Basically, we have different view from the FL’s understanding. In our understanding, the zero-padding procedure mentioned in [3] is intended to match the DCI size when the overall size of DCI 0\_0 is different from other DCIs. Besides, in this procedure, the zero padded bits should be added at the end of DCI, not to each DCI field.  Therefore, it seems different issue from our proposal. When UL resource allocation Type 2 (interlaced structure) is configured, the FDRA field should be limited to 5 or 6 bits according to SCS of BWP. So, it is proposed from our side that the UE may interpret the FDRA field by zero padding when the SCS of active UL BWP (e.g., 15 kHz) is smaller than the SCS of initial UL BWP (e.g., 30 kHz). Moreover, it is also proposed that the UE may use the MSB (or LSB) 5 bits of FDRA field when the SCS of active UL BWP (e.g., 30 kHz) is larger than the SCS of initial UL BWP (e.g., 15 kHz).  As a result, we think this issue should be treated by e-mail discussion.  Regarding **Type2CB#3**, this issue is not A9 but A16 as in the following, and it is not about the non-scheduled PDSCH group. Rather, this issue is about the scheduled PDSCH group actually scheduled by gNB, but UE misses the corresponding DL scheduling DCI.   * *A16: What NFI value should a UE assume when the UE is provided with UL DAI (different than 4) for a PDSCH group that was not scheduled for the UE?*   For this reason, we think this issue should also be treated by e-mail discussion. |
| OPPO | **IA3-1**: it is important to have a common understanding, when UE receives a RAR in unlicensed band but the Msg3 in licensed band (in SUL), how to interpret the RAR UL grant content. If this is not clarified, there will be mis-understanding between gNB and UE, causing serious issue for initial access.  **Type3CB#1**: the current specification is not correct. The HARQ-ACK codebook size is dynamically determined based on the received PDSCH. This is completely wrong w.r.t. what we have discussed during the WI for Type 3 CB. |

# Reference

[1]. R1-20xxxxx, FL summary for initial access signals and channels, Qualcomm

[2]. R1-20xxxxx, FL summary for DL signals and channels, Lenovo

[3]. R1-20xxxxx, FL summary for UL signals and channels, Ericsson

[4]. R1-20xxxxx, FL summary for channel access procedures for NR-U, Nokia

[5]. R1-20xxxxx, FL summary for initial access procedure enhancements, Charter Communications

[6]. R1-20xxxxx, FL summary on NR-U HARQ maintenance, Huawei

[7]. R1-20xxxxx, FL summary for on NRU configured grant enhancement, Vivo

[8]. Reserved