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

**Jan 25th – Feb 5th, 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

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| Init-1 | Invalid SSB by SSB positions in burst for FBE | 1 |
| Init-2 | Clarification on usage of subCarrierSpacingCommon for unlicensed | 1 |

FL recommendations

* Both issues are to capture previous agreements properly and are editorial in nature

## 2.2 DL signals and channels

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

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| DL-A1 | PDCCH monitoring for grouped search space sets | 1 |
| DL-A2 | Search space set group switching | 1 |
| DL-B1 | Action time when UE receive MAC CE for (de)activation of Scell/CSI-RS/TCI state/SRS | 1 |
| DL-B2 | Discussion on LS from RAN4 in R1-2100008 | 1 |
| DL-C1 | Front-loaded DMRS collision with CORESET | 1 |
| DL-C2 | PDSCH mapping type B with durations larger than 7 symbols | 2 |
| DL-C3 | Processing time | 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 | Correction to description of FDRA field description in DCI 0\_0 and 0\_1 to ensure that it is defined both for the case when interlacing is configured and the case when interlacing is not configured. | 2 |
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FL recommendations (see further details in [3]):

## 2.4 Channel access

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

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| CA 2.1 | LBT type for non-contiguous SRS and PUSCH/PUCCH | 1 |
| CA 2.2 | Clarifications to LBT with consecutive UL transmissions | 1 |
| CA 2.3 | Clarifications to channel access for semi-static channel occupancy | 7 |
| CA 2.4 | Clarifications to restrictions for Type 1 DL channel access / DRS | 2 |
| CA 2.5 | Clarifications to UL CWS adjustment | 1 |
| CA 2.6 | Multi-channel Channel Access | 2 |
| CA 2.7 | LBT type indication in DCI 0\_2 and 1\_2 | 1 |
|  |  |  |

FL recommendations:

## 2.5 Initial access procedures

For Initial access procedures, no issue identified

## 2.6 HARQ enhancements

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

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| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| NRU-HARQ1 | Whether a correction is needed to specify the UE assumption on the values of NFI and DAI for a non-scheduled PDSCH group (in case of reporting enhanced Type 2 HARQ-ACK codebook in PUSCH or PUCCH). Discussed as issue A9 in the past. | 2 |
| NRU-HARQ2 | Whether there is a need to address FFS: Type-3 codebook with NDI where the UE has not yet obtained HARQ-ACK information for a TB corresponding to a scheduled PDSCH reception. Discussed as issue B4 in the past. | 4 |
| NRU-HARQ3 | Corrections on Type-3 HARQ-ACK codebook (broken down into 5 issues, see section 2.3) | 1 |
| NRU-HARQ4 | Corrections on power control for enhanced Type 2 and for Type-3 HARQ-ACK codebook (broken down into 4 questions, see section 2.4) | 1 |
| MultiPUSCH | Corrections on multi-PUSCH scheduling:   * Issue 1: possible ambiguity in the TDRA bitfield size in relation to *pusch-TimeDomainAllocationListForMultiPUSCH* * Issue 2: possible reference to a wrong RRC parameter instead of *pusch-TimeDomainAllocationListForMultiPUSCH* * Issue 3: possible ambiguous UE behaviour in case of simultaneous configuration of semi-static repetitions (with pusch-AggregationFactor) and pusch-TimeDomainAllocationListForMultiPUSCH | 3 |

FL recommendations:

* HARQ1, HARQ2, HARQ3-issues2&3, HARQ4 (Q3&Q4) may not require a correction because they have already been discussed in the past without consensus on the essentiality of a correction
* Multi-PUSCH issue 1 may not require a correction
* HARQ3-issue1 requires a clarification from the proponent
* HARQ3-issue4, HARQ3-issue5, HARQ4 (Q1, and potentially Q2), Multi-PUSCH issue 2 and issue 3 may require a correction

## 2.7 CG enhancements

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

|  |  |  |
| --- | --- | --- |
| Issue # | Issue summary | # Contributions |
| CG-TP1 | The intra-slot frequency hopping is supported while the inter-slot frequency hopping is not supported for NR-U configured grant PUSCH repetition | 1 |
| CG-TP2 | RRC parameter name alignment in 38.213 | 1 |
| CG-TP3 | for K=1 and UE provided with higher layer parameters *cg-nrofSlots* and *cg-nrofPUSCH-InSlot*, the case of whether UE transmits in *repK* earliest transmission occasion candidate is missing in 38.214 | 1 |
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FL recommendations:

* TP1 and TP3 can be discussed through email
* TP2 is editorial

## 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 | Init-1 | Init-2 | DL-A1 | DL-A2 | DL-B1 | DL-B2 | DL-C1 | DL-C2 | DL-C3 | UL-01 |
| Qualcomm | E | E |  | E |  | Y | Y | Y | Y | E |
| Ericsson |  | E |  | E | Y (see comment) | Y | Y (see comment | Y (see comment) |  | E |
| Samsung |  | E |  |  |  | Y |  |  |  | E |
| ZTE | E | E |  |  |  | Y |  |  |  | E |
| Nokia, NSB |  | E |  |  |  | Y |  |  |  | E |
| Spreadtrum |  | E |  |  |  | Y | Y | Y | Y | E |
| Sharp | E | E |  |  |  | Y |  |  | Y | E |
| Fujitsu |  | E |  |  | Y | Y |  |  |  | E |
| ASUSTeK |  | E |  |  |  | Y |  |  |  | E |
| Huawei, HiSilicon |  | E |  |  | Y | Y | Y | E | Y | E |
| OPPO |  | E |  |  |  | Y | Y | Y | Y | E |
| LG |  | E |  |  |  | Y | Y | Y |  | E |
| WILIS |  | E |  |  |  | Y |  |  |  | E |
| Lenovo |  | E |  | E | Y (see comment) | Y |  |  | Y |  |
| vivo |  | E |  |  |  | Y | Y | Y | Y | E |

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| Company | CA 2.1 | CA 2.2 | CA 2.3 | CA 2.4 | CA 2.5 | CA 2.6 | CA.2.7 | CG-TP1 | CG-TP2 | CG-TP3 |
| Qualcomm |  | E | Y |  |  |  |  |  | E |  |
| Ericsson |  | E | Y |  |  |  | Y |  |  |  |
| Samsung |  | Y | E | E |  |  |  |  | E |  |
| ZTE |  | E | Y |  |  |  |  |  | E |  |
| Nokia, NSB |  |  | Y |  |  |  |  |  | E |  |
| Spreadtrum |  | E | Y |  |  |  |  |  | E |  |
| Sharp |  | E | Y |  |  |  |  |  | E |  |
| Fujitsu |  | E | Y |  |  |  |  |  | E |  |
| ASUSTeK |  |  |  |  |  |  |  |  | E | Y(see comment) |
| Huawei, HiSilicon |  |  | Y | E |  | Y |  |  | E | Y |
| ETRI | Y | Y | Y |  |  |  |  |  |  |  |
| OPPO |  |  | Y |  |  |  | Y |  | E |  |
| LG |  | E | Y |  | Y | E | Y |  | E |  |
| Intel |  | E | Y |  |  |  |  |  | E |  |
| WILUS |  | E | Y | E |  |  |  |  | E |  |
| Lenovo |  | E (see comment) | Y |  | Y |  |  |  |  |  |
| vivo |  | E | Y |  |  |  |  | Y (see comment) | E |  |

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| Company | HARQ1 (A9) | HARQ2 (B4) | HARQ3-issue1 | HARQ3- issues2&3 | HARQ3- issue4 | HARQ3- issue5 |
| Qualcomm |  |  | Y |  | E | E |
| Samsung |  |  | Y |  | E | E |
| ZTE |  |  |  |  | E | E |
| Nokia, NSB |  |  |  |  | E | E |
| Spreadtrum |  |  | Y |  | E | E |
| Sharp |  | Y | Y |  | E | E |
| ASUSTeK |  |  | Y |  | E | E |
| Huawei, HiSilicon |  |  | Y |  | Y | Y |
| OPPO |  | Y | Y |  | Y | E |
| LG | Y | Y |  |  | E | E |
| Intel |  | Y | Y |  | E | E |
| WILUS |  |  | Y |  | E | E |
| vivo | Y |  |  |  |  | E |
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|  | HARQ4  (answers may refer to Q1, Q2, Q3, Q4) | Multi-PUSCH  Issue 1 | Multi-PUSCH  Issue 2 | Multi-PUSCH  Issue 3 |
| Qualcomm |  | E | E | Y |
| Samsung | Y |  | E | Y |
| ZTE | Y for Q2 | E | E | Y |
| Nokia, NSB | E |  | E | Y |
| Spreadtrum | Y | E | E | Y |
| Sharp |  |  | E | Y |
| Fujitsu |  |  | E | Y |
| ASUSTeK | Y |  | E | Y |
| Huawei, HiSilicon | E for Q1, Q2 |  | Y | Y |
| OPPO |  |  | E | Y |
| LG |  |  | E | Y |
| Intel | Y |  | E | Y |
| vivo | E |  | E | Y |

Please provide additional company views below

|  |  |
| --- | --- |
| **Company** | **View** |
| Qualcomm | For issue DL-B2, may have a separate email discussion for LS  For issue DL-C1/C2/C3, can combine them together in an email thread  For HARQ related issues, can combine them together in an email thread |
| Ericsson | There is one DL issue that is missing from the DL FL summary (please see Section 2 of R1-2101304 for a description of this issue). We think this issue should be treated. It could also be included in the editorial corrections.  For issue DL-B1, we are okay to discuss; however, the scope of the discussion should be limited to 38.213 Section 4.3 on SCell activation/deactivation timing. None of the other MAC-CE activation/deactivation timing rules in 38.213 or 38.214 depend on the HARQ-ACK timing indictor field.  DL-C1 and DL-C2 can be discussed together if the discussion can fit within the email thread budget of 4. Otherwise, this can be treated at a later time. |
| Samsung | * For issue Init-1, the TP is not needed since the previous sentence already explicitly mention “The gNB and UEs shall not transmit any transmissions”, which certainly include SSB transmission. We believe this is the motivation to make it a conclusion in the previous meeting, and an explicit conclusion in the meetings means no spec impact. * For HARQ4, we think Q1~Q3 is necessary, no need of Q4. |
| Spreadtrum | * For issue DL-C2, we would like to provide further elaborations. In 38.211 section 7.3.1.5, it is specified that the resource elements used for PDSCH are not used for the transmission of the associated DM-RS or DM-RS intended for the other co-scheduled UEs. If the DMRS is dropped due to shift to the end of the PDSCH allocation, then the occupied REs used for DMRS could be used for PDSCH transmission. It is feasible for single-symbol DMRS case. However, for double-symbol case, if one DMRS symbol is dropped due to shift to the last symbols of the PDSCH allocation, there is ambiguity whether the REs of the other DM-RS symbol of the double-symbol DMRS could be used for PDSCH transmission. From section 7.3.1.5, it is not clear whether the REs occupied by the whole DMRS can be used for PDSCH transmission if one DMRS symbol is dropped. |
| Fujitsu | For issue Init-2, we noticed that the following part in TS 38.331 may also need to be editorially corrected considering the similar issue (a draft TP is provided) and was wondering whether it could be discussed under issue Init-2 or should be leaved to RAN2.   |  | | --- | | ***subcarrierSpacing***  Subcarrier spacing to be used in this BWP for all channels and reference signals unless explicitly configured elsewhere. Corresponds to subcarrier spacing according to TS 38.211 [16], table 4.2-1. The value *kHz15* corresponds to µ=0, value *kHz30* corresponds to µ=1, and so on. Only the values 15 kHz, 30 kHz, or 60 kHz (FR1), and 60 kHz or 120 kHz (FR2) are applicable. For the initial DL BWP this field has the same value as the field *subCarrierSpacingCommon* in *MIB* of the same serving cell for operation without shared spectrum channel access and has the value corresponding to the subcarrier spacing of the corresponding SSB for initial access of the same serving cell for operation with shared spectrum channel access. | |
| ASUSTeK | * For CG-TP3, we would like to have a clarification on UE’s behaviour according to current spec, whether UE can perform *repK* =1 CG transmission on transmission occasion which is not an earliest transmission occasion from higher layer parameters *cg-nrofSlots* and *cg-nrofPUSCH-InSlot*. Since as for *repK* >1, current spec has specified UE has to perform transmission on earliest *repK* transmission occasions. We’re wondering whether it’s a missing case for *repK* =1. We are fine to follow major company’s view for necessity of this issue or clarify in future meeting. * For HARQ4, we are open for Q1~Q3, and consider Q4 is not necessary. * For Multi-PUSCH Issue 2, we think it’s an editorial correction. Whether to have suffix “-r16” can up to spec editor. |
| Huawei, HiSilicon | For DL-B1, the behaviour and K1=-1 should be clarified, otherwise the spec is not complete. For DL-C1/C3, it is related to UE processing capability when DMRS is shifting for new PDSCH mapping type B length which is not discussed before and will also impact implementation for licensed band. For DL-C3, we think it is editorial because it is just align the language for different l\_d values for the same behaviour.  Regarding HARQ3- issue4, HARQ3- issue5, Multi-PUSCH Issue 2, two companies responded that the corrections are editorial. The corrections may be simple and non-controversial, but that doesn’t mean that they qualify as editorial. Our response is Y.  Regarding HARQ3-issue1, a response from the proponent (or from another company) may be useful to better understand where the claimed problem occurs in the pseudo-code in 9.1.4.  Issue CA2.6 is important as the current UL multi-channel access procedure does not address the case wherein a wideband PUSCH is overlapping with different sets of bonded channels defined in 36.104 and cited in that subclause. Consequently, Type 2 channel access procedure cannot be applied.  Issue CA2.1 has been discussed before and it is not of high priority. Issue CA2.2 also addresses a corner case When Type 1chanell access is switched to Type 2 channel access within gNB COT. For Issue CA2.7, indicating Channel access, CPE, and CAPC was not discussed in the WI.  Regarding CG-TP1, the proposed enhancement aims at improving the frequency diversity of NR-U CG PUSCH through intra-slot frequency hopping. In our view it is not necessary because if frequency diversity is a concern, then FDRA type 2 should be used which is more suitable as well to exploit PSD and meeting the oCB requirement than FDRA type 1 |
| ETRI | For CA2-1, we think the discussions about SRS resource have been done little in Rel-16, and we still think there is an ambiguity to transmit SRS resources in the current specification. To complete the UE behaviour, the SRS transmission needs the further description as with other UL transmissions. It can be discussed jointly with CA2-2, as those issues are regarded as clarifying consecutive UL transmissions. |
| OPPO | Regarding HARQ3-issue4, in our understanding, if a UE is provided only one PUCCH resource set for transmission of HARQ-ACK information, the PUCCH resource set may only carry one or two HARQ-ACK information bits and it should not be used for Type-3 HARQ-ACK codebook. So we think discussion for this issue is needed. |
| LG | For CA 2.6, no intra-cell guard band related LBT procedure was already agreed under WB agenda but not captured in current specification. Furthermore, most companies agreed with our proposal on this issue in RAN1#102-e and RAN1#103-e meeting. Therefore, the corresponding TPs should be discussed to make consensus. |
| Lenovo | Init-1: We think such a correction is not essential.  DL-A1: We think such a correction is not essential.  DL-B1: The proposal is a reasonable behaviour, but we are not sure whether a CR is necessary  DL-B2: Prefer to discuss together with LS-related contributions (AI5) in a separate thread.  CA 2.1: We think such a correction is not essential.  CA 2.2: We think such a correction may not be essential. |
| vivo | For CG-TP1, whether and how to support frequency hopping is unclear in current spec. For HW’s comment, at least one conclusion is needed to clarify that frequency hopping is not supported for NRU configured grant. |

Email discussion recommendations. High priority items are the issues with good support to discuss. Low priority items are ones with some support to discuss. Recommend to discuss the low priority items in best effort fashion.

* DL signals and channels: High priority on DL-C1, DL-C2, DL-C3. Low priority on DL-A2
* Channel access: High priority on CA 2.3, CA 2.2. Low priority on CA 2.1, CA 2.4, CA 2.5, CA 2.6, CA 2.7.
* HARQ enhancements: High priority on HARQ3-Issue1, HARQ3-issue4, HARQ3-issue5, HARQ4, Multi-PUSCH issue2, Multi-PUSCH Issue3. Low priority on HARQ1, HARQ2, Multi-PUSCH issue1
* Other editorial issues in initial access signals, UL signals and channels and configured grant: High priority on Init-2, UL-01, CG-TP2. Low priority on Init-1, CG-TP1, CG-TP3.
* Email discussion for RAN4 LS in R1-2100008 (DL-B2)

# Reference

[1]. Reserved

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

[3]. R1-20xxxxx, FL summary for UL signals and channels v2, 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