**3GPP TSG RAN WG1#104bis-e R1-2nnnnnn**

**e-Meeting, April 12th – 20th, 2021**

**Agenda Item: 7.2.2**

**Source: Moderator (Lenovo)**

**Title: Email discussion/approval [104b-e-NR-NRU-01] on DL signals and channels**

**Document for: Discussion, Decision**

# Scope of Discussion

This document summarises the discussion on the following topics:

[104b-e-NR-NRU-01] Email discussion/approval on DL signals and channels until Apr-16 – Alex (Lenovo)

* DL-A1, DL-B3 (editorial), DL-D1

# Topic DL-A: PDCCH Monitoring

## Issue DL-A1 (R1-2102786): Maximum size of switchTriggerToAddModList-r16 and switchTriggerToReleaseList-r16

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| Background:***FL Note: Please refer to the detailed background given in R1-2102786.*** |
| Proposal:**To align 38.213 and 38.331 with RAN1's original intention, request RAN2 to increase the maximum size of the lists switchTriggerToAddModList-r16 and switchTriggerToReleaseList-r16 to maxNrofAggregatedCellsPerCellGroup (i.e., max 16 instead of 4).** |

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| Company  | Comments |
| LG Electronics | Support the proposal. If this proposal is agreed, RAN1 need to send an LS to RAN2 to request the change. Would it be the correct understanding? |
| Intel | Clarification for my understanding. if the proposal is agreed, does it mean UE can equivalently support up to 16 cell groups for SSSG switching? Each cell behaves like a separate cell group. |
| Spreadtrum | Support the proposal. The same question as LG is whether to send an LS to RAN2? |
| ZTE, Sanechips | Support the proposal.Suggest to send an LS to RAN2 to inform the modification on the maximum size of switchTriggerToAddModList-r16 and switchTriggerToReleaseList-r16 had been agreed in RAN1. |
| Nokia, NSB | We support the proposal, and a possible LS to RAN2. |
| LG Electronics | As to LS: We agree to send an LS to RAN2, if agreed.As to Intel’s question: I understood the question is for the case where *cellGroupsForSwitchList* is not configured. For that case, I agree with Intel’s understanding and it is clearly captured in TS 38.213 Clause 10.4, as follows.If a UE is provided *cellGroupsForSwitchList*, indicating one or more groups of serving cells, the following procedures apply to all serving cells within each group; otherwise, the following procedures apply only to a serving cell for which the UE is provided *searchSpaceGroupIdList*. |
| Samsung | Support the TP. |
| Huawei, HiSilicon | Support the FL’s proposal.  |
| vivo | Support the proposal. Sending a LS to RAN2 is necessary. |
| Sharp | Support the TP. |
| WILUS | Support the FL’s proposal. |
| Qualcomm | Not sure why we need the proposal. This is a NBC change and we should only adopt it if there is a serious issue with the original design. My understanding of the problem is, there are up to 4 bits (per our earlier agreement) in a single SFI that can be used for search space set group switching, and it is only a problem if we have more than 4 unlicensed serving cells and we want to switch the search space set groups of these serving cells separately (without configuring *cellGroupsForSwitchList*). It is hard for me to see a use case that we need to switch separately. For a typical NR-U use case, for different unlicensed serving cells, we will use a multi-channel channel access, and we should switch all these cells together. In that case, a single group with all serving cells inside should be enough. |
| Apple  | We can be ok on this CR. However, in LS to RAN4, we should clearly state that more than 4 triggers in switchTriggerToAddModList-r16 is only allowed for the case without configuring *cellGroupsForSwitchList.* Otherwise, extension up to 16 without clear statement would imply that it is allowed to configure with more than 4 cell groups for switching, which is not aligned with earlier RAN4 agreement.  |
| Ericsson | Support the proposal (as proponent)Yes, it will be necessary to inform RAN2 of the change.We agree with Apple's suggestion for clarifying that the change is for the case when cell groups are not configured, except the LS is to RAN2, not RAN4 :-)@Jing (Qualcomm), I agree if cell *cellGroupsForSwitchList* is configured, there is no issue. The issue occurs when cell groups are not configured. Moreover, support of cell groups is an optional UE capability. Hence, if cell groups are not configured due to lack of UE capability, and if the network wishes to switch more than 4 cells, even if they are all switched together, it cannot do that since the list size is (incorrectly) limited to 4.  |

# Topic DL-B: CSI Measurement, Report

## Issue DL-B3 (R1-2103335): CSI measurement across DL bursts

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| Background:***FL Note: Please refer to the detailed background given in R1-2103335.*** |
| Proposal:**Adopt the following text proposal in TS 38.214 Clause 5.2.1.4.2.**

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| For operation with shared spectrum channel access, if the UE is configured with a *CSI-ReportConfig* with higher layer parameter *reportQuantity* set to ‘cri-RI-PMI-CQI ‘, ‘cri-RI-i1’, ‘cri-RI-i1-CQI’, ‘cri-RI-CQI’ or ‘cri-RI-LI-PMI-CQI’, the UE shall derive:- the CSI parameters without averaging two or more instances of any periodic or semi-persistent *nzp-CSI-RS-Resources* in the corresponding *NZP-CSI-RS-ResourceSet* for channel measurement or for interference measurement located in different DL transmissions,- the instances of the *nzp-CSI-RS-Resources* are not in the same channel occupancy duration indicated by DCI format 2\_0, if the UE is provided at least one of *SlotFormatIndicator* or co*-DurationList*; or- the instances of the *nzp-CSI-RS-Resources* occur within a set of consecutive symbols which are not all occupied by PDSCH(s) and/or aperiodic CSI-RS(s) indicated by DCI formats and, if any, the corresponding PDCCH(s), if the UE is neither provided with *CO-DurationPerCell* nor *SlotFormatIndicator*, but is provided with *csi-RS-ValidationWith-DCI*- the interference measurements for computing CSI value based on periodic/semi-persistent CSI-IM measured only in OFDM symbol(s) that fulfill the same conditions under which the UE is expected to receive periodic/semi-persistent CSI-RS as described in Clause 11.1 and Clause 11.1.1 of [6, TS 38.213]. |

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| Company  | Comments |
| LG Electronics | Support the TP as suggesting proponent.For more details, this TP is mainly to avoid the following potential misunderstanding.* If symbol(s) corresponding to P/SP-CSI-RS #1 are all occupied by PDSCH#1,
* And if symbol(s) corresponding to P/SP-CSI-RS #2 are all occupied by PDSCH#2,
* Then UE can average measurements from P/SP-CSI-RS #1 and #2 since a set of symbols (corresponding to P/SP-CSI-RS #1 and #2) are all occupied by PDSCHs.

Figure 1. Example of P/SP-CSI-RS validationHowever, this is not aligned with the agreement where averaging measurements from P/SP-CSI-RS #1 and #2 is allowed only if all OFDM symbols between the set of symbols (corresponding to P/SP-CSI-RS #1 and #2) are occupied by a set of PDSCH and/or CSI-RS(s), including the scheduling/triggering PDCCH(s), without any gap in-between.In addition, we can resolve the following issues:* Corresponding PDCCH(s) may not occur in the same carrier especially for cross-carrier scheduling, so cannot be used for CSI-RS validation
* Typo of PDDCH
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| Intel | We think the problem identified by the TP is valid. One clarification, if PDSCH #1 and PDSCH #2 are the two repetitions that are scheduled by a same PDCCH, what is the behavior? In our views, average for CSI should be allowed in this case. Fine to correct the typo |
| Spreadtrum | Regarding “PDDCH”->“PDCCH”，we are fine to fix the typo.For the rest part, one clarification is needed. If the scheduled PDCCH corresponding to PDSCH#3 (or group common PDCCH) intended for the UE is located between the PDSCH#1 and the PDSCH#2, and there is no gap in-between, what is the behavior of UE? We think it is nature to allow the UE to average the CSI measurement in this case. |
| ZTE, Sanechips | Support the TP to make spec text more accurate and align with the previous agreement.Agree to fix the typo. |
| Nokia, NSB | We support the TP |
| LG Electronics | As to Intel’s question: I disagree. The point here DL burst should be kept without any gaps in between. Regardless of whether PDSCH#1 and PDSCH#2 are scheduled by the same DCI or different DCIs, if PDSCH#1 and PDSCH#2 are discontinuous, UE shall not perform averaging for CSI-RS #1 and #2.As to Spreadtrum’s question: I agree. If there is another PDSCH#3 occupying all symbols between ending of PDSCH#1 and beginning of PDSCH#2, the UE shall perform averaging for CSI-RS #1 and #2. |
| Samsung | Support the TP |
| Huawei, HiSilicon | Support the FL’s proposal |
| Vivo | Support the TP |
| Sharp | Support the TP. |
| WILUS | We support this TP. |
| Qualcomm | Support the TP |
| Apple  | Support the TP as said in preparation phase.  |
| Ericsson | After LGE's clarification of our comments during the preparation phase, we are fine with the TP. |

# Topic DL-D: Missing description of PDCCH features for shared spectrum in TS38.300

## Issue DL-D1 (R1-2102326): Missing description of PDCCH features for shared spectrum in TS38.300

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| Background:The functionalities of physical downlink control channels (PDCCH) are described in section 5.2.3 of TS38.300. However, the new features introduced in NR-U Rel-16 were not reflected in the description, which results incompleteness of the specification. The missing features includes:* Indicating Available RB set
* Indicating COT duration
* Trigger search space set group switching
* Indicating CG-DFI indication
* Triggering one-shot HARQ codebook feedback
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| Proposal:***Add description of PDCCH features introduced for shared spectrum operation in TS38.300.***TP#4: in TS38.3005.2.3 Physical downlink control channelsThe Physical Downlink Control Channel (PDCCH) can be used to schedule DL transmissions on PDSCH and UL transmissions on PUSCH, where the Downlink Control Information (DCI) on PDCCH includes:- Downlink assignments containing at least modulation and coding format, resource allocation, and hybrid-ARQ information related to DL-SCH;- Uplink scheduling grants containing at least modulation and coding format, resource allocation, and hybrid-ARQ information related to UL-SCH.In addition to scheduling, PDCCH can be used to for- Activation and deactivation of configured PUSCH transmission with configured grant;- Activation and deactivation of PDSCH semi-persistent transmission;- Notifying one or more UEs of the slot format;- Notifying one or more UEs of the PRB(s) and OFDM symbol(s) where the UE may assume no transmission is intended for the UE;- Transmission of TPC commands for PUCCH and PUSCH;- Transmission of one or more TPC commands for SRS transmissions by one or more UEs;- Switching a UE's active bandwidth part;- Initiating a random access procedure;- Indicating the UE(s) to monitor the PDCCH during the next occurrence of the DRX on-duration;- In IAB context, indicating the availability for soft symbols of an IAB-DU.- Triggering one shot HARQ-ACK codebook feedback- Notifying one or more UEs of the available RB sets, COT duration and search space set group switching for shared spectrum operation.- Indicating downlink feedback information for configured grant PUSCH (CG-DFI) for shared spectrum operationA UE monitors a set of PDCCH candidates in the configured monitoring occasions in one or more configured COntrol REsource SETs (CORESETs) according to the corresponding search space configurations.A CORESET consists of a set of PRBs with a time duration of 1 to 3 OFDM symbols. The resource units Resource Element Groups (REGs) and Control Channel Elements (CCEs) are defined within a CORESET with each CCE consisting a set of REGs. Control channels are formed by aggregation of CCE. Different code rates for the control channels are realized by aggregating different number of CCE. Interleaved and non-interleaved CCE-to-REG mapping are supported in a CORESET.Polar coding is used for PDCCH.Each resource element group carrying PDCCH carries its own DMRS.QPSK modulation is used for PDCCH. |

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| Company  | Comments |
| LG Electronics | Support the TP. |
| Intel | Support the TP |
| Spreadtrum | Support the TP |
| ZTE, Sanechips | Support the TP with a bit modification: “COT duration” can be revised to “remaining channel occupancy duration” to align the description of TS 38.213.Suggested modification:......- Notifying one or more UEs of the available RB sets, remaining channel occupancy duration ~~COT duration~~ and search space set group switching for shared spectrum operation......... |
| Nokia, NSB | We support the TP. Regrading ZTE’s comment above, “COT duration” is aligned with the wording in 38.212, and we prefer keeping the wording as in the TP. |
| Samsung | Support the TP |
| Huawei, HiSilicon | Support the TP |
| Vivo | Support the TP |
| Sharp | Support the TP. |
| WILUS | Support the TP. |
| Qualcomm | Support the TP. |
| Apple  | Support the TP. |
| Ericsson | Support the TP. |