**3GPP TSG RAN WG1#102-e R1-draft**

**e-Meeting, August 17th –28th, 2020**

**Agenda Item: 7.2.2.1.2**

**Source: Moderator (Lenovo)**

**Title: Feature lead summary for NR-U DL Signals and Channels**

**Document for: Discussion, Decision**

# Introduction

This document summarizes issues raised by documents submitted to RAN1#102-e on AI 7.2.2.1.2, and includes suggestions for the email discussion.

Where easily available from documents, the corresponding proposals are listed below as "P#".

Companies are invited to provide their views on discussion priorities in the table below.

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| Company | Topics for Thread #1 | Topics for Thread #2 | Comments |
| Moderator | B5: SFI (+other fields) presence configurability in DCI format 2\_0 **and**B11: General Slot Format determination and corresponding UE behaviour **and**B1:Special states/indications in "available RB set indication" | A5: Search space set switching behavior**or**C2: SPS PDSCH presence/dropping **and**D1:CSI-RS transmission power, measurements, validity/presence of periodic/semi-persistent CSI-RS (D1) | B1/B5/B11 seem to be closely related, so they should be discussed together. Same for C2/D1. |
| LG Electronics | Agree with Moderator. B5/B11/B1 seem to be tied with each other and can be discussed within the same thread all together. | A5+A6 or C2+D1 | “R1-2006299, P6” is now moved from B11 to A6. At least from our perspective, A6 issue is essential to alleviate excessive SS set dropping. In detail, even though SS sets having different group indices would never be monitored at the same time, SS set BD/CCE limit rule is currently applied to both of them. Therefore, we suggest to discuss A6 in addition to A5. |
| Nokia, NSB | B5: SFI (+other fields) presence configurability in DCI format 2\_0  **and**B11: Clarification on which parts of 11.1 and 11.1.1 are applicable given the configured field-combination in DCI 2\_0  | A5: SCS of timer granularity  **and**C2: SPS PDSCH presence/dropping **and**D1: CSI-RS transmission power, measurements, validity/presence of periodic/semi-persistent CSI-RS (D1) | Thread 1: No need to re-discuss B1 again, in our opinion. Thread 2: We think we should take A5 in addition to C2+D1, but focus only on essential aspects of A5.  |
| Qualcomm | Agree with Moderator | A5+C2+D1 |  |
| ZTE, Sanechips | Agree to discuss B5 and B11. | A5+C2+D1 | There is no need to further discuss B1 due to it had been discussed many times in the previous meeting and no consensus.For D1, CSI-RS measurement is also listed in AI 7.2.2.2.2 initial access procedure to be discussed. So we need to first determine which agenda item this part should be discussed in. |
| Samsung | B5+B11 | A5(SCS of timer granularity)+C2+D1 |  |
| Sharp | Agree with Moderator, i.e. B5/B11/B1. | C2+D1. Also, OK to discuss the reference SCS in A5 as well. |  |
| Ericsson | Agree with moderator.Also, it important to reach a common understanding on COT for FBE (B7/B6), if it is not yet established. In our view this should be prioritized and have a clear baseline in Rel-16 due to the impact on ongoing URLLC Rel-17 WI. | A5+ D1 (See below)D1/C2: Disagree to discuss proposals in D1/C2 that extend CSI-RS validation to DL SPS PDSCH. Even in licensed, may not be transmission in DL SPS even activated. UE does detection and send feedback. Nothing different here.  | It is important to settle the definition of Cot for FBE. This has a large impact on the ongoing WI for URLLC with respect to support of UE initiated COT.Please note that in our view the definition is clear and already supported by spec. But based on previous discussion we are not sure if the view is commonly shared. |
| Huawei, HiSilicon | Agree with Moderator, B5+B11+B1. | A5+D1,  | Move R1-2005807, P3 from B11 to B1.In D1, the transmission power of CSI-RS might be covered in AI 7.2.2.2.2. |

# Classification of corrections by topics and issues

The following topics and issues have been identified by submitted contributions. Since the number of email discussions is limited to 3 in RAN1#102, only a limited set of issues can be discussed. It is understood that more than 3 should be seen as essential correction discussion items for Rel-16 NRU.

The numbering of topics/issues from previous meetings has been largely kept for consistency, with slight modifications of the description or new issues as applicable. Issues that have been brought up before but for which no input is available in this meeting are put in *italics*.

## Topic A: Search space

List of issues, proposals, and suggestions for handling in the email discussion phase.

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| Issue | Description | Reference Tdoc | FL suggestion |
| *A1* | *Search space group/set configuration* |  |  |
| *A2* | *Switching timer* | Merged with A5 |  |
| *A3* | *Processing time for switching* | See Z4 |  |
| *A4* | *Default SS group* |  |  |
| A5 | Search space set switching behaviour | R1-2005598, P1:The reference SCS for searchSpaceSwitchingTimer-r16 can be defined as the maximum SCS across all configured BWPs in the cell, or cell group if configured. The following TP#1 can be considered.10.4 Search space set group switchingA UE can be provided, by *searchSpaceSwitchingTimer-r16*, a timer value. The UE decrements the timer value by one after each slot for a reference SCS ~~configuration~~ . The reference SCS is the maximum SCS across all configured BWPs in a serving cell, or all serving cells within each group if the UE is provided *searchSpaceSwitchingGroupList-r16.*R1-2005807, P1:UE should determine the reference SCS for searchSpaceSwitchingTimer-r16 as the minimum SCS across all configured BWPs in the Cell, or Cell group if configured. The reference SCS should be maintained during the timer countdown procedure. The corresponding text proposal is in TP#1 in the appendix.R1-2005905 (edited):SCS of cell/cell-group specific timer is defined as lowest SCS among BWPs of serving cell or serving cells of a cell group, if configured.R1-2006018, P1:For explicit triggering, the trigger flag is associated with cell group; for implicit triggering, any serving cell of the cell group will trigger the whole cell group switching.R1-2006018, P1:Adopt TP1 into section 10.4 of TS 38.213 for search space set switching based on a cell group.10.4 Search space set group switchingIf a UE is provided by *SearchSpaceSwitchTrigger-r16* a location of a search space set group switching flag field for a serving cell or for a set of serving cells, provided by *searchSpaceSwitchingGroupList-r16,* in a DCI format 2\_0, as described in Clause 11.1.1- if the UE detects a DCI format 2\_0 and a value of the search space set group switching flag field in the DCI format 2\_0 is 0, the UE starts monitoring PDCCH according to search space sets with group index 0, and stops monitoring PDCCH according to search space sets with group index 1, on the serving cell or any serving cell of the same set of serving cells, provided by *searchSpaceSwitchingGroupList-r16* at a first slot that is at least symbols after the last symbol of the PDCCH with the DCI format 2\_0- if the UE detects a DCI format 2\_0 and a value of the search space set group switching flag field in the DCI format 2\_0 is 1, the UE starts monitoring PDCCH according to search space sets with group index 1, and stops monitoring PDCCH according to search space sets with group index 0, on the serving cell or any serving cell of the same set of serving cells, provided by *searchSpaceSwitchingGroupList-r16* at a first slot that is at least symbols after the last symbol of the PDCCH with the DCI format 2\_0, and the UE sets the timer value to the value provided by *searchSpaceSwitchingTimer-r16*- if the UE monitors PDCCH on a serving cell according to search space sets with group index 1, the UE starts monitoring PDCCH on the serving cell according to search space sets with group index 0, and stops monitoring PDCCH according to search space sets with group index 1, on the serving cell or any serving cell of the same set of serving cells, provided by *searchSpaceSwitchingGroupList-r16* at the beginning of the first slot that is at least symbols after a slot where the timer expires or after a last symbol of a remaining channel occupancy duration for the serving cell that is indicated by DCI format 2\_0If a UE is not provided *SearchSpaceSwitchTrigger-r16* for a serving cell,- if the UE detects a DCI format by monitoring PDCCH according to a search space set with group index 0, the UE starts monitoring PDCCH according to search space sets with group index 1, and stops monitoring PDCCH according to search space sets with group index 0, on the serving cell or any serving cell of the same set of serving cells, provided by *searchSpaceSwitchingGroupList-r16* at a first slot that is at least symbols after the last symbol of the PDCCH with the DCI format, the UE sets the timer value to the value provided by *searchSpaceSwitchingTimer-r16* if the UE detects a DCI format by monitoring PDCCH in any search space set- if the UE monitors PDCCH on a serving cell according to search space sets with group index 1, the UE starts monitoring PDCCH on the serving cell according to search space sets with group index 0, and stops monitoring PDCCH according to search space sets with group index 1, on the serving cell or any serving cell of the same set of serving cells, provided by *searchSpaceSwitchingGroupList-r16* at the beginning of the first slot that is at least symbols after a slot where the timer expires or, if the UE is provided a search space set to monitor PDCCH for detecting a DCI format 2\_0, after a last symbol of a remaining channel occupancy duration for the serving cell that is indicated by DCI format 2\_0R1-2006018, P3:Adopt TP2 into section 10.4 of TS 38.213 to define PDCCH monitoring behavior in BWP switching case.10.4 Search space set group switchingA UE determines a slot and a symbol in the slot to start or stop PDCCH monitoring according to search space sets for a set of serving cells, provided by *searchSpaceSwitchingGroupList-r16*, based on the smallest SCS configuration of the active BWPs in the set of serving cells and, if any, in the serving cell where the UE receives a PDCCH and detects a corresponding DCI format 2\_0 triggering the start or stop of PDCCH monitoring according to search space sets.For search space set switching applied to a serving cell, if UE is monitoring PDCCH according to search space sets with group index 1 before BWP switching and if the BWP switching time is shorter than configured timer or indicated COT duration, the UE shall monitor PDCCH according to search space sets with group index 1 on the target BWP, otherwise, the UE shall monitor PDCCH according to search space sets with group index 0 on the target BWP. For search space set switching applied to a serving cell group, the PDCCH monitoring behavior on the target BWP after BWP switching shall follow the same behavior as other cell in the same cell group.R1-2006273, P1:The minimum SCS across all configured BWPs in the Cell, or Cell group (if configured) should be used as the reference SCS.R1-2006350, P1:Update TS 38.214 Clause 10.4 based on TP #1.A UE can be provided, by *searchSpaceSwitchingTimer-r16*, a timer value for a serving cell for which the UE is provided *searchSpaceGroupIdList-r16* or, if provided, a set of serving cells provided by *searchSpaceSwitchingGroupList-r16*. The UE decrements the timer value by one after each slot based on the smallest SCS configuration among all configured DL BWPs in the serving cell or the set of serving cells ~~for a reference SCS configuration~~ .R1-2006350, P2:Update TS 38.214 Clause 10.4 based on TP #2.A UE determines a slot and a symbol in the slot to start or stop PDCCH monitoring according to search space sets for a serving cell for which the UE is provided *searchSpaceGroupIdList-r16* or, if provided, a set of serving cells~~,~~ provided by *searchSpaceSwitchingGroupList-r16*, based on the smallest SCS configuration among all configured DL BWPs ~~of the active BWPs~~ in the serving cell or the set of serving cells and, if any, in the serving cell where the UE receives a PDCCH and detects a corresponding DCI format 2\_0 triggering the start or stop of PDCCH monitoring according to search space sets.R1-2006350, P3:Update TS 38.214 Clause 10.4 based on TP #3.UE can be provided a group index for a respective Type3-PDCCH CSS set or USS set by *searchSpaceGroupIdList-r16* for PDCCH monitoring on a serving cell. If the UE is provided *searchSpaceGroupIdList-r16* for a serving cell, the UE expects to be provided both a group index 0 and a group index 1 for the serving cell. If the UE is not provided *searchSpaceGroupIdList-r16* for a search space set, the following procedures are not applicable for PDCCH monitoring according to the search space set.R1-2006483, P2: For mixed numerology case, the smallest SCS of the corresponding active BWP across CCs within a CC group and the CC in which a DCI format 2\_0 triggering group switching is detected, if any, is used as reference SCS for timer decrement operation.R1-2006553, P1:The reference SCS configuration μ for the timer decrement is the smallest SCS configuration μ of the configured BWPs in a serving cell or in a set of serving cells if provided | Discuss in Thread #1 |
| *A6* | *Search space BD adjustments/dropping* | R1-2006299, P6:If a UE is provided with two groups of search space sets and configured with the number of monitored PDCCH candidates (or non-overlapped CCEs) for a slot more than blind decoding capability for the UE, the UE applies search space set dropping rule per search space set group for type3-PDCCH CSS and USS sets. |  |
| *A7* | *Number of cell groups in searchSpaceSwitchingGroupList-r16* |  |  |

## Topic B: DCI format 2\_0, COT indication, RB set indication

List of issues, proposals, and suggestions for handling.

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| Issue | Description | Reference Tdoc | FL suggestion |
| B1 | Special states/indications in "available RB set indication" (e.g. no RB set information available yet) | R1-200618, P8:For RB set indication in DCI format 2\_0, a special state of the available RB sets indicating “all the RB sets are not available” can be used to indicate the unprepared available RB sets information.R1-200618, P9:For RB set indication in DCI format 2\_0, a special state of the SFI structure can be introduced to indicate the LBT failed cell.R1-2006273, P3:It is not necessary to define special states/indications in “available RB set indication” to indicate the available RB sets at the beginning of the COT.R1-2006553, P6:* UE behaviours for RB sets for which the gNB is not aware of LBT status should follow the behaviour for outside CO durations.
* TS38.213 to capture the special value (i.e. all ‘0’) of the RB set indicator value for a self-indication case when the gNB is not aware of LBT status of other RB sets.

R1-2005807, P3:When UE detect a DCI format 2\_0 carrying available RB set indicator indicating all RB sets are unavailable (all ‘0’) including the RB set where the detected DCI format 2\_0 locates, UE will assume the current available RB set indication is not valid and continue monitoring PDCCH candidates on these RB sets if configured. The corresponding text proposal is in TP#3 in the appendix. | See also B11Discuss as part of Thread #2 |
| *B2* | *Switch CAT4 LBT to CAT2 LBT* |  |  |
| *B3* | *Indication of "out of COT"* |  |  |
| *B4* | *Reference subcarrier spacing for COT duration indication* |  |  |
| B5 | SFI (+other fields) presence configurability in DCI format 2\_0 | R1-2005331, P1:When COT duration field is not configured but SFI is configured in DCI 2\_0, one special entry of SFI (i.e. index 255 SFI) is used to indicate that the DCI 2\_0 carrying SFI is within UE’s initiated COT.R1-2005598, P2:RAN1 could determine the following configuration relationships between four fields in DCI format 2\_0, and send a LS to RAN2 for make some restrictions on configuring slotFormatCombToAddModList, availableRB-SetPerCell-r16, co-DurationPerCell-r16 and searchSpaceSwitchTrigger-r16 in TS 38.331. • SSS group switching flag field can be configured independently with other three fields in DCI format 2\_0. • For LBE, one of SFI field and CO-duration indicator field should be configured in case of RB-set indicator field presence in DCI format 2\_0.  • For FBE, no conditions for configurability of RB-set indicator field and other two fields i.e. SFI and CO-duration indicator should be introduced.R1-2006018, P5:In LBE, the UE is expected to be configured with at least one of SFI indication and COT duration indication if RB set indicator is configured.R1-2006273, P2:* For LBE, either *co-DurationPerCell-r16* or *SFI field* should be configured in case of *AvailableRB-SetPerCell-r16* presence in DCI 2\_0.
* For FBE, any one of *co-DurationPerCell-r16, SFI field* or *AvailableRB-SetPerCell-r16* can be independently configured.

R1-2006299, P2:Regardless of FBE or LBE, the configuration of AvailableRB-SetPerCell-r16 requires the presence of at least one of SlotFormatIndicator and CO-DurationPerCell-r16.R1-2006299, P3:RB set indicator field for a serving cell in DCI format 2\_0 may not be configured only if the serving cell is configured with a single RB set or no guard band and if DCI format 2\_0 for the serving cell is configured to be monitored on the serving cell.R1-2006350, P4:In LBE, when UE is configured to monitor DCI format 2\_0, *AvailableRB-SetPerCell-r16* is configured together with either *SlotFormatCombinationsPerCell* or *co-DurationPerCell-r16*.R1-2006350, P5:In FBE, either *co-DurationPerCell-r16* field in DCI format 2\_0 is not used, or UE expects that *co-DurationPerCell-r16* always indicates the last symbol of a COT. | Discuss as part of Thread #2 |
| B6 | COT duration indication/determination | R1-2005807, P5:In FBE, UE can obtain COT duration from SFI or COT duration indicator in DCI format 2\_0. UE can also derive COT duration acquired by gNB from the FFP configuration if neither SFI nor COT duration indicator is configured. The corresponding text proposal is in TP#2 in the appendix. R1-2005905, P2:Align specification to RAN1 agreement “The indication of available LBT bandwidth is valid until the end of the determined channel occupancy”R1-2005911, P1:When COT duration is not explicitly configured for a semi-static channel access system, the UE assumes the COT ends at the beginning of the idle period in the same fixed frame period.R1-2005911, P2:If COT duration is explicitly configured, UE does not expect the COT duration to indicate the COT ends later than the beginning of the idle period in the same fixed frame period that the COT duration information is detected.R1-2006018, P6:In FBE, the COT duration is determined by the configured FFP period if neither SFI indication nor COT duration indication is configured.R1-2006273, P4:It is not necessary to define a new UE behavior when the indicated slot format indication exceeds the remaining CO duration.R1-2006836, P2:When COT duration is not explicitly configured for a semi-static channel access system, the UE assumes the COT ends at the beginning of the idle period in the same fixed frame period.R1-2006836, P3:If COT duration is explicitly configured, UE does not expect the COT duration to indicate the COT ends later than the beginning of the idle period in the same fixed frame period that the COT duration information is detected. |  |
| *B7* | *Channel occupancy in FBE (semi-static channel access)* | Merged with B6 |  |
| B8 | Available RB sets configuration | R1-2005598, P3:If none of RB-set indicator, SFI, and CO-duration indicator is configured in DCI format 2\_0 for a serving cell, UE assumes no RB-sets of the serving cell are unavailable for DL reception on the serving cell. However, there is no specification impact. |  |
| B9 | UE behaviour outside COT duration | R1-2006299, P1:If a UE detects DCI format 2\_0 indicating remaining channel occupancy time shorter than the number of slots for which SFI-index field provides corresponding slot formats, the UE shall ignore slot format information corresponding to slots outside of gNB’s channel occupancy time. |  |
| *B10* | *SFI length configuration* |  |  |
| B11 | General Slot Format determination and corresponding UE behaviour | R1-2005807, P2:When UE is not configured to detect available RB set indicator or UE fails to detect DCI format 2\_0 carrying available RB set indicator, UE should monitor PDCCH based on search space configuration assuming all RB set are available. The corresponding text proposal is in TP#3 in the appendix.R1-2005807, P4:When UE detect a DCI format 2\_0 carrying available RB set indicator indicating all RB sets are unavailable (all ‘0’) including the RB set where the detected DCI format 2\_0 locates, UE assumes the RB set where the detected DCI format 2\_0 locates remains available until the end of the indicated channel occupancy duration. The corresponding text proposal is in TP#2 in the appendix.R1-2005905, P1:Adopt the following clarification for 38.213 on optionality of fields in DCI 2\_0: 11.1.1 UE procedure for determining slot formatThis clause apply for a serving cell that is included in a set of serving cells configured to a UE by corresponding parameter(s) - *slotFormatCombToAddModList* and *slotFormatCombToReleaseList*. - *availableRB-SetToAddModList-r16*, - *searchSpaceSwitchTriggerToAddModList-r16*, or- *co-DurationPerCellList-r16.* R1-2006018, P4:If RB-set indicator is not configured, but SFI or CO-duration is configured in DCI format 2\_0 for a serving cell, UE assumes that all the RB sets of the serving cell are available for DL reception within the gNB COT.R1-2006299, P4:If a UE is monitoring a DCI format 2\_0 indicating available RB sets for the first carrier and also for the second carrier and the UE detects the DCI format 2\_0 on the first carrier,* If the bitmap corresponding to the first carrier is signalled to all ‘0’,
	+ The UE recognizes that DL burst has just started to be transmitted for the first carrier and also for the second carrier where the corresponding bitmap is signalled to all ‘0’, and the UE expects that available RB sets for the first and second carriers may be updated during this DL burst.
* Otherwise,
	+ For the second carrier where the corresponding bitmap is signalled to all ‘0’, the UE does not expect any DL receptions on the second carrier during channel occupancy time.

R1-2006299, P5:Adopt the following text proposal in TS 38.213 section 10.If a UE is provided *availableRB-SetPerCell-r16,* the UE is not required to monitor PDCCH candidates that overlap with any RB from RB sets that are indicated as unavailable for receptions by DCI format 2\_0 as described in Clause 11.1.1, except that all RB set(s) for a serving cell where DCI format 2\_0 is detected are indicated as unavailable for receptions.R1-2006553, P2:The UE configured with monitoring of DCI format 2\_0 without SFI should follow the procedure defined in subclause 11.1.1.11.1.1 UE procedure for determining slot formatThis clause applies for a serving cell that is included in a set of serving cells configured to a UE by either *slotFormatCombToAddModList* and *slotFormatCombToReleaseList*, *availableRB-SetsToAddModList-r16* and *availableRB-SetsToRelease-r16*, *searchSpaceSwitchTriggerToAddModList-r16* and *searchSpaceSwitchTriggerToReleaseList-r16*, or *co-DurationsPerCell ToAddModList-r16* and *co-DurationsPerCellToReleaseList-r16*.R1-2006553, P4:UE with DCI format 2\_0 carrying search space set group switching flag field only should follow behaviours defined in subclause 11.1.R1-2006553, P5:If SFI is not configured, UE behaviours for inside CO duration should be the same as in subclause 11.1.R1-2006836, P1:For a cell with multiple LBT bandwidth but availableRB-setPerCell-r16 not configured, the UE will consider all RB sets are in the COT when DCI 2\_0 is detected. | Discuss as part of Thread #2 |

## Topic C: PDSCH

List of issues, proposals, and suggestions for handling.

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| Issue | Description | Reference Tdoc | FL suggestion |
| C1 | PDSCH mapping on intra cell guard band | R1-2005844, P1: • For DCI 1-1, use RateMatchPattern to avoid the PDSCH mapping to PRBs in intra-cell guard bands • For DCI 1-0, enhance the spec 38.214 to void the PDSCH mapping to PRBs in intra-cell guard bands as given in the text proposal for 38.214A UE shall assume that the PRBs inside the intra-cell guard bands defined in Clause 7, if configured, are not available for PDSCH scheduled by PDCCH with DCI format 1\_0.R1-2005844, P2:On RAN4 L2 [1], Option 1 is slightly preferred since it maintain the aligned behavior between gNB and UE • Option 1: If UE cannot transmit HARQ-ACK on MAC-CE deactivation due to UL CCA failure, UE continues to be in its previous state, i.e., it should measure and report L1-RSRP until it successfully transmits HARQ-ACK |  |
| C2 | SPS PDSCH presence/dropping | R1-2005905, P3 (PDSCH aspect):Adopt the following simplification of specification in sub-clause 11.1 of TS38.213, as well as provide behavior for DL SPS PDSCH.For operation with shared spectrum channel access, if a UE is provided *CSI-RS-ValidationWith-DCI-r16*, ~~is not provided~~ *~~CO-DurationPerCell-r16~~*~~, and is not provided~~ *~~SlotFormatIndicator~~*, and if the UE is configured by higher layers to receive a CSI-RS or PDSCH in a set of symbols of a slot, the UE cancels the CSI-RS or PDSCH  reception in the set of symbols of the slot if the UE does not detect a DCI format indicating an aperiodic CSI-RS reception or scheduling a PDSCH reception in the set of symbols of the slot. R1-2005905, P4 (PDSCH aspect):Modify the below paragraph of sub-clause 11.1.1 of TS38.213, related to Case 2.2, to correct a parameter name and align specification to agreement, as well as provide behavior for DL SPS PDSCH.For operation with shared spectrum channel access, if a UE is configured by higher layers to receive a CSI-RS or PDSCH and the UE is provided *CO-DurationPerCell-r16* and is not provided *~~SlotFormatIndicator~~ slotFormatCombToAddModList*, for a set of symbols of a slot that are indicated as downlink or flexible by *tdd-UL-DL-ConfigurationCommon* or *tdd*-*UL-DL-ConfigurationDedicated*, or when *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* are not provided, the UE cancels the CSI-RS or PDSCH reception in the set of symbols of the slot that are not within the indicated remaining channel occupancy duration.R1-2005905, P5 (PDSCH aspect):Adopt the following TP to provide support for Case 2.3For a set of symbols of a slot that are indicated as flexible by *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* if provided, or when *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* are not provided to the UE, and if the UE does not detect a DCI format 2\_0 providing a slot format for the slot- the UE receives PDSCH or CSI-RS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format- the UE transmits PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format, a RAR UL grant, fallbackRAR UL grant, or successRAR- the UE receives PDCCH as described in Clause 10.1- if the UE is configured by higher layers to receive PDSCH or CSI-RS in the set of symbols of the slot, the UE does not receive the PDSCH or the CSI-RS in the set of symbols of the slot, except when UE is provided *CO-DurationPerCell-r16* and symbols of the slot are within the indicated remaining channel occupancy duration.R1-2006483, P1:Extend the validation rule defined for P/SP-CSI-RS reception to SPS PDSCH reception and CSI-IM resource.  | Discuss as part of Thread #3 |
| C3 | FDRA interpretation with DCI 1\_0 in CSS | R1-2006093, P4:For a PDSCH scheduled by DCI 1\_0 in CSS, the first PRB indicated by FDRA bit field in the DCI is the first PRB in the RB set in which scheduling PDCCH is received. Adopt the following TP for TS 38.214.5.1.2.2 Resource allocation in frequency domain For a PDSCH scheduled with a DCI format 1\_0 in any type of PDCCH common search space, regardless of which bandwidth part is the active bandwidth part, RB numbering starts from the lowest RB of the CORESET in which the DCI was received; otherwise RB numbering starts from the lowest RB in the determined downlink bandwidth part.For operation with shared spectrum channel access, when a UE is configured with *intraCellGuardBandDL-r16* for DL carrier, for a PDSCH scheduled with a DCI format 1\_0 in any type of PDCCH common search space, regardless of which bandwidth part is the active bandwidth part, RB numbering starts from the lowest RB of the lowest RB-set in which the DCI was received. |  |

## Topic D: CSI-RS

List of issues, proposals, and suggestions for handling.

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| Issue | Description | Reference Tdoc | FL suggestion |
| D1 | CSI-RS transmission power, measurements, validity/presence of periodic/semi-persistent CSI-RS | R1-2005331, P2:When CSI-RS-Resource-Mobility is configured in a cell operation with shared spectrum access, if it locates at the same slot as at least one of candidate SSB(s) indicated by associatedSSB, UE proceeds with the measurement on the corresponding CSI-RS resource upon detection of the candidate SSB; otherwise UE is not required to monitor the corresponding CSI-RS resource.R1-2005807, P6:The same CSI-RS validation rules when UE is not configured with CO-duration and SFI can be reused when UE is configured with COT-duration but not SFI and the preconfigured P/SP CSI-RS location is inside CO duration indicated by the COT duration field.R1-2005905, P3 (CSI-RS aspect):Adopt the following simplification of specification in sub-clause 11.1 of TS38.213, as well as provide behavior for DL SPS PDSCH.For operation with shared spectrum channel access, if a UE is provided *CSI-RS-ValidationWith-DCI-r16*, ~~is not provided~~ *~~CO-DurationPerCell-r16~~*~~, and is not provided~~ *~~SlotFormatIndicator~~*, and if the UE is configured by higher layers to receive a CSI-RS or PDSCH in a set of symbols of a slot, the UE cancels the CSI-RS or PDSCH  reception in the set of symbols of the slot if the UE does not detect a DCI format indicating an aperiodic CSI-RS reception or scheduling a PDSCH reception in the set of symbols of the slot. R1-2005905, P4 (CSI-RS aspect):Modify the below paragraph of sub-clause 11.1.1 of TS38.213, related to Case 2.2, to correct a parameter name and align specification to agreement, as well as provide behavior for DL SPS PDSCH.For operation with shared spectrum channel access, if a UE is configured by higher layers to receive a CSI-RS or PDSCH and the UE is provided *CO-DurationPerCell-r16* and is not provided *~~SlotFormatIndicator~~ slotFormatCombToAddModList*, for a set of symbols of a slot that are indicated as downlink or flexible by *tdd-UL-DL-ConfigurationCommon* or *tdd*-*UL-DL-ConfigurationDedicated*, or when *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* are not provided, the UE cancels the CSI-RS or PDSCH reception in the set of symbols of the slot that are not within the indicated remaining channel occupancy duration.R1-2005905, P5 (CSI-RS aspect):Adopt the following TP to provide support for Case 2.3For a set of symbols of a slot that are indicated as flexible by *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* if provided, or when *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* are not provided to the UE, and if the UE does not detect a DCI format 2\_0 providing a slot format for the slot- the UE receives PDSCH or CSI-RS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format- the UE transmits PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format, a RAR UL grant, fallbackRAR UL grant, or successRAR- the UE receives PDCCH as described in Clause 10.1- if the UE is configured by higher layers to receive PDSCH or CSI-RS in the set of symbols of the slot, the UE does not receive the PDSCH or the CSI-RS in the set of symbols of the slot, except when UE is provided *CO-DurationPerCell-r16* and symbols of the slot are within the indicated remaining channel occupancy duration.R1-2006093, P1:Adopt following TP for TS38.214 to be more aligned with the agreement.For operation with shared spectrum channel access, the UE should not average CSI-RS measurements for channel estimation from occasions of an NZP CSI-RS (defined in [4, TS 38.211]) located in different DL transmissions which satisfies any of the following conditions* gap among the different DL transmissions is greater than if the UE does not detect a DCI format 2\_0 that indicates a channel occupancy duration which overlaps the occasions of the NZP CSI-RS
* the DL transmissions are in different detected channel occupancy durations

R1-2006093, P2:When DCI 2\_0 contains COT duration and SFI, UE cancels the reception of periodic or semi-persistent CSI-RS configured by higher layers at least on downlink and flexible symbols (including the case where no semi-static TDD configuration is provided to the UE) if the periodic or semi-persistent CSI-RS location is outside the CO duration indicated by the COT duration field.R1-2006093, P3:If UE cannot transmit HARQ-ACK on MAC-CE deactivation due to UL CCA failure, UE continues to be in its previous state, i.e., it should measure and report L1-RSRP until it successfully transmits HARQ-ACK (Option 1)R1-2006299, P7:Consider the following methods to receive/cancel P/SP-CSI-RS within CO duration if DCI format 2\_0 contains CO duration field but not SFI index field.* Method 1: UE behaves as if DCI format 2\_0 were not to be detected. In other words, UE cancels P/SP-CSI-RS if P/SP-CSI-RS symbols configured as flexible by higher layer signalling are scheduled by UL grant.
* Method 2: For more controllability on RRC-configured P/SP-CSI-RS resources, explicit 1 bit field in DCI format 2\_0 is introduced, where P/SP-CSI-RS within CO duration is valid only when the corresponding bit is set to ‘1’. (For higher layer configured UL case, this bit can be reused or separate 1 bit field can be added)

R1-2006299, P8:If at least one of SFI and CO duration fields is configured, UE assumes constant power for NZP CSI-RS(s) configured within the indicated remaining CO duration.R1-2006299, P9:If any of SFI and CO duration fields are not configured but *CSI-RS-ValidationWith-DCI-r16* is configured, UE assumes constant power for NZP-CSI-RS(s) configured for the time duration where the set of PDSCH and/or CSI-RS is consecutively scheduled/triggered without any gap in between.R1-2006299, P10:For interference measurements based on CSI-IM, the UE shall derive the interference measurements for computing CSI value based on only measurements in OFDM symbols occupied by the serving cell.R1-2006299, P11:For interference measurements based on NZP-CSI-RS, the UE shall not average the interference measurements for computing CSI value across different transmission bursts from the UE's perspective. | Discuss as part of Thread #3 |
| *D2* | *CSI-RS for tracking are confined to RB set* |  |  |

## Topic E: DMRS for PDSCH mapping type B

List of issues, proposals, and suggestions for handling.

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| Issue | Description | Reference Tdoc | FL suggestion |
| E1 | Shifting of DMRS, DMRS position | R1-2006093, P5:Adopt following TP for TS38.211 to avoid ambiguity about DM-RS position when l\_"d" = 6 (for extended cyclic prefix)…- for all values of the PDSCH duration other than 2, 5, 6 for extended cyclic prefix, and 7 symbols, the UE is not expected to receive a DM-RS symbol beyond the :th symbol;…R1-2006862, P1:Adopt the following TP for TS 38.211…if the higher-layer parameter *lte-CRS-ToMatchAround* or *additionalLTE-CRS-ToMatchAroundList* is configured, the PDSCH duration symbols for normal cyclic prefix, the subcarrier spacing configuration , single-symbol DM-RS is configured ~~at least one PDSCH DM-RS symbol in the PDSCH allocation collides with a symbol containing resource elements as indicated by the higher-layer parameter~~ *~~lte-CRS-ToMatchAround~~* ~~or~~ *~~additionalLTE-CRS-ToMatchAroundList~~*, then shall be incremented by one ~~in all slots~~.… |  |

## Topic F: SSB transmission power

List of issues, proposals, and suggestions for handling.

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| Issue | Description | Reference Tdoc | FL suggestion |
| *F1* | *SSB transmission power for SSB-based RRM measurements* |  |  |

# Capturing earlier agreements and spec alignment

The following issues have been identified as being agreed earlier, but having not been fully or correctly captured in the specs so far. It is suggested to discuss or reflect related proposals in the TP stage of RAN1#102-e.

Note that the numbering here is not consistent with the numbering of earlier meetings.

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| Issue | Description | Reference Tdoc |  |
| Z1 | IE Names in DCI 2\_0 | R1-2005598, P5:The child IEs (availableRB-SetPerCell-r16, CO-DurationPerCell-r16 and searchSpaceSwitchTrigger-r16) quoted in the definition of DCI format 2\_0 in TS 38.212 should be replaced by the parent IEs (xxxToAddModList-r16). The TP#3 can be adopted.7.3.1.3.1 Format 2\_0DCI format 2\_0 is used for notifying the slot format, COT duration, available RB set, and search space set group switching. The following information is transmitted by means of the DCI format 2\_0 with CRC scrambled by SFI-RNTI:- If the higher layer parameter *slotFormatCombToAddModList* is configured, - Slot format indicator 1, Slot format indicator 2, …, Slot format indicator *N*, - If the higher layer parameter *~~availableRB-SetPerCell-r16~~availableRB-SetsToAddModList-r16* is configured, - Available RB set Indicator 1, Available RB set Indicator 2, …, Available RB set Indicator *N1*, - If the higher layer parameter *~~CO-DurationPerCell-r16~~co-DurationsPerCellToAddModList-r16* is configured- COT duration indicator 1, COT duration indicator 2, …, COT duration indicator *N2.*- If the higher layer parameter *~~searchSpaceSwitchTrigger-r16~~**searchSpaceSwitchTriggerToAddModList-r16* is configured- Search space set group switching flag 1, Search space set group switching flag 2, …, Search space set group switching flag *M.*The size of DCI format 2\_0 is configurable by higher layers up to 128 bits, according to Clause 11.1.1 of [5, TS 38.213]. | Discuss as part of Thread #4 |
| Z2 | Capturing RRC parameter *subcarrierSpacing-r16* | R1-2006553, P3:TS38.213 to implement subcarrierSpacing configuration for CO duration indication.11.1.1 UE procedure for determining slot formatFor each serving cell in the set of serving cells, the UE can be provided: - …- a reference SCS configuration for the list of Channel Occupancy durations, by *subcarrierSpacing-r16*- a location of a search space set group switching flag field in DCI format 2\_0, by *SearchSpaceSwitchTrigger-r16*, that indicates a group from two groups of search space sets for PDCCH monitoring for scheduling on the serving cell as described in Clause 10.4. | Discuss as part of Thread #4 |
| Z3 | Parameter correction for CSI-RS reception | R1-2006553, P7:*SlotFormatCombinationsPerCell* should be referred to for determination of whether or not SFI is configured.For operation with shared spectrum channel access, if a UE is configured by higher layers to receive a CSI-RS and the UE is provided *CO-DurationPerCell-r16* and is not provided *SlotFormatCombinationsPerCell*, for a set of symbols of a slot that are indicated as downlink or flexible by *tdd-UL-DL-ConfigurationCommon* or *tdd*-*UL-DL-ConfigurationDedicated*, or when *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* are not provided, the UE cancels the CSI-RS reception in the set of symbols of the slot that are not within the indicated remaining channel occupancy duration. | Discuss as part of Thread #4 |
| Z4 | Processing time for switching | R1-2005598, P4:The description on UE processing time for SSS group switching in TS 38.213 should be clarified. The following TP#2 can be considered.10.4 Search space set group switchingA UE can be provided by *searchSpaceSwitchingDelay-r16* a number of symbols . The UE applies the indicated and does not expect the indicated to be smaller than a minimum value of . If the UE indicates a corresponding capability, ~~where a~~ the minimum value of ~~is~~ provided in Table 10.4-1 for ~~UE processing capability 1 and~~ UE processing capability 2 and SCS configuration applies. Otherwise, a minimum value of provided in Table 10.4-1 for UE processing capability 1 and SCS configuration applies ~~If the UE indicates a corresponding capability, the UE applies the value for UE processing capability 2; otherwise, the UE applies the value for UE processing capability 1 for SCS configuration~~ . | Discuss as part of Thread #4 |

# Other proposals

R1-2006350, P6:

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| If the absence of any other technology sharing a channel can be guaranteed on a long-term basis (e.g. by level of regulation) and if a gNB provides UE(s) with higher layer parameters *ChannelAccessMode-r16 ='semistatic'* by SIB1 or dedicated configuration, a periodic channel occupancy can be initiated every within every two consecutive radio frames, starting from the even indexed radio frame at ~~with a maximum channel occupancy time ,~~ where in , is a higher layer parameter provided in *semiStaticChannelAccessConfig-r16* and . Each comprises a channel occupancy time from the beginning and an idle period from the end. |

FL suggestion: Discuss in the context of channel access AI.

# List of submitted TDocs

The following TDocs have been used to compile above summary:

R1-2005331 Remaining issues on physical DL channel design in unlicensed spectrum vivo

R1-2005598 Remaining issues on the DL channels for NR-U ZTE, Sanechips

R1-2005807 Maintenance on DL signals and channels Huawei, HiSilicon

R1-2005844 DL signals and channels for NR-unlicensed Intel Corporation

R1-2005905 Remaining issues on DL signals and channels Nokia, Nokia Shanghai Bell

R1-2005911 DL signals and channels Ericsson

R1-2006018 Discussion on the remaining issues of DL signals and channels OPPO

R1-2006093 DL signals and channels for NR-U Samsung

R1-2006273 Remaining issues in DL signals and channels for NR-U Spreadtrum Communications

R1-2006299 Remaining issues of DL signals and channels for NR-U LG Electronics

R1-2006350 Remaining issues on DL signals and channels for NR-U ETRI

R1-2006483 Remaining issues of DL signal and channels Apple

R1-2006553 Remaining issues on DL signals/channels for NR-U Sharp

R1-2006836 TP for DL signals and channels for NR-U Qualcomm Incorporated

R1-2006862 Maintenance for DL signals and channels for NR-U Panasonic Corporation