**3GPP TSG RAN WG1 #122bis R1-2507976**

**Prague, Czech, Oct 13th – 17th, 2025**

**Source: Ad-Hoc Chair (NTT DOCOMO)**

**Title: Session Notes of AI 9.11**

**Agenda Item: 9.11**

**Document for: Endorsement**

* 1. ***UE features for*** ***MCE for NR Phase 3***

**Agreement:**

For FG 66-3 and 66-4:

* Adopt “Per BC” for Type column
* Adopt “n/a” for FDD/TDD differentiation, FR1/FR2 differentiation and capability interpretation columns
* Add the following note in FG 66-3 Note column
  + “Note: Only cell(s) with {120kHz SCS, FR2-1} among the set of cells [can be scheduled with more than one PDSCH]”
* Add the following note in FG 66-4 Note column
  + “Note: Only cell(s) with {120kHz SCS, FR2-1}, {15kHz SCS, FR1} and/or {30kHz SCS, FR1} [can be scheduled with more than one PUSCH]”
* Remove the following FFS in FG 66-3 and 66-4
  + FFS: Whether to limit this FG to particular FR and/or SCS
  + FFS: Whether to separate this FG per FR and/or SCS
  + FFS: other component(s)
* For FG 66-3, define “at least one of {49-1, 49-1b, 66-1}” as prerequisite FGs
* For FG 66-4, define “at least one of {49-2, 49-2b, 66-2}” as prerequisite FGs

**Agreement:**

Update FG 66-1 as follows:

* Change FR2 to FR2-1 for Component 2 (as agreed in RAN1#122)
* Introduce the following new components:
  + “Scheduling cell is PCell if set of cells includes PCell, and scheduling cell is PCell or an SCell if set of cells includes only SCells.”
  + “Max number of co-scheduled cells per set of cells supported by UE is reported with candidate value set of {2, 3, 4}”
  + “Max number of sets of cells supported by UE across PUCCH groups: Candidate value set of {1, 2, 3, 4, 5, 6, 7, 8}”
  + “Max number of sets of cells supported by UE for a same scheduling cell: Candidate value set of {1, 2, 3, 4}”
  + “Supported HARQ feedback types, candidate values: {type 1, type2, type 1 and type 2}, Note: the UE shall report the same value for all supported BC for FG 66-1”
  + “Supported co-scheduled cell indication schemes: Candidate value set of {FDRA field based, co-scheduled cell indicator field based, both}”
  + “Support Type-2 for ‘Antenna port(s)’ field”

**Agreement:**

Update FG 66-2 as follows:

* Change FR2 to FR2-1 for Component 2 (as agreed in RAN1#122)
* Introduce the following new components:
  + “Scheduling cell is PCell if set of cells includes PCell, and scheduling cell is PCell or an SCell if set of cells includes only SCells”
  + “Max number of co-scheduled cells per set of cells supported by UE is reported with candidate value set of {2, 3, 4}”
  + “Max number of sets of cells supported by UE across PUCCH groups: Candidate value set of {1, 2, 3, 4, 5, 6, 7, 8}”
  + “Max number of sets of cells supported by UE for a same scheduling cell: Candidate value set of {1, 2, 3, 4}”
  + “Supported co-scheduled cell indication schemes: Candidate value set of {FDRA field based, co-scheduled cell indicator field based, both}”
  + “Support Type-2 for ‘Antenna port(s)’ field”

**Agreement:**

* Introduce the following new component in FG 66-1:

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| Monitoring SS set(s) for DCI format 1\_3 for a set of cells for the following cases   * 1) Search space set configuration for DCI format 1\_3 for the set of cells is provided only on the scheduling cell, or; * 2) Search space set configurations for DCI format 1\_3 for the set of cells with the same searchSpaceId are provided on both the scheduling cell and a serving cell in the set of cells with the scheduling cell being NOT in the set of cells * UE supporting FG 66-1 can additionally report whether the UE support following case   + 3) Search space set configurations for DCI format 1\_3 for the set of cells with the same searchSpaceId are provided on both the scheduling cell and a serving cell in the set of cells with the scheduling cell being in the set of cells |

* Introduce the following new component in FG 66-2:

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| Monitoring SS set(s) for DCI format 0\_3 for a set of cells for the following cases   * 1) Search space set configuration for DCI format 0\_3 for the set of cells is provided only on the scheduling cell, or; * 2) Search space set configurations for DCI format 0\_3 for the set of cells with the same searchSpaceId are provided on both the scheduling cell and a serving cell in the set of cells with the scheduling cell being NOT in the set of cells * UE supporting FG 66-2 can additionally report whether the UE support following case   + 3) Search space set configurations for DCI format 0\_3 for the set of cells with the same searchSpaceId are provided on both the scheduling cell and a serving cell in the set of cells with the scheduling cell being in the set of cells |

Proposal 1-2:

Introduce the following new component in FG 66-1:

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| X. The number of unicast DL DCIs to process per N consecutive slots of scheduling cell for a set of cells configured for multi-cell PDSCH scheduling by DCI format 1\_3   * One DCI format 1\_3 for the set of cells and, * One unicast DL DCI formats 1\_0/1\_1/1\_2 (if supported) for each of the cells that are not scheduled by DCI 1\_3 * SCS1 is the SCS of scheduling CC, and SCS2 is the SCS for [reference CC] * For SCS1 smaller than [or equal to] SCS2, N = 1 * For SCS1 larger than SCS2, N is based on pair of (SCS1, SCS2): N=2 for (30,15) |

* FFS: Reference CC in the set of cells to determine N, to be down-selected from the following:
  + Alt-1: “reference CC” refers to the scheduled CC SCS for each pair of scheduling CC and scheduled CC in all the scheduled CCs in the cell set
  + Alt-2: “reference CC” refers to the smallest SCS among all the scheduled cells in the cell set

Proposal 1-5:

Introduce the following new component in FG 66-1:

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| The number of unicast UL DCIs to process per N consecutive slots of scheduling cell for a set of cells configured for multi-cell PUSCH scheduling by DCI format 0\_3   * For FDD scheduling cell   + Up to one DCI format 0\_3 for the set of cells and,   + Up to one unicast UL DCI formats 0\_0/0\_1/0\_2 (if supported) for each of the cells   + For a cell in a set of cells, no more than one DCI scheduling PUSCH for the cell * For TDD scheduling cell   + Up to two DCI format 0\_3 for the set of cells and,   + Up to two unicast UL DCI formats 0\_0/0\_1/0\_2 (if supported) for each of the cells   + For a cell in a set of cells, no more than two DCI scheduling PUSCH for the cell * For low-to-high SCS, N = 1. * For high-to-low SCS, N is based on pair of (scheduling CC SCS, [scheduled CC] SCS): N=2 for (30,15) |

* FFS: Reference CC in the set of cells to determine N, to be down-selected from the following:
  + Alt-1: “Scheduled CC” refers to the scheduled CC SCS for each pair of scheduling CC and scheduled CC in all the scheduled CCs in the cell set
  + Alt-2: “Scheduled CC” refers to the smallest SCS among all the scheduled cells in the cell set

Proposal 1-6:

Adopt the following updates in FG 66-1/2:

* Consequence if the feature is not supported by the UE
  + For FG 66-1: “Multi-cell PDSCH scheduling by DCI format 1\_3 with different SCS and/or different carrier type is not supported”
  + For FG 66-2: “Multi-cell PUSCH scheduling by DCI format 0\_3 with different SCS and/or different carrier type is not supported”
* Remove “FFS: Other component(s)” in FG 66-1/2 Component column
* Remove FFS in FG 66-1/2 Note column

Proposal 1-7:

Update the FG for “Support of three sets of (carrier type, SCS) for the cells in the set for multi-cell PDSCH scheduling by DCI format 1\_3 with different SCS and/or different carrier type” as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 66-1a | Support of three sets of (carrier type, SCS) for the cells in the set for multi-cell PDSCH scheduling by DCI format 1\_3 with different SCS and/or different carrier type | ~~FFS~~  Supported applicable combinations of the following from the band combination:  - Three sets of (carrier type, SCS) for the cells in the set: {(FR1 licensed FDD, 15kHz), (FR1 licensed TDD, 30kHz), (FR2-1, 60kHz), (FR2-1, 120kHz)}  - A set of (carrier type, SCS) for scheduling cell: {(FR1 licensed FDD, 15kHz), (FR1 licensed TDD, 30kHz)} | ~~FFS~~ 66-1 | ~~FFS~~ Yes | ~~FFS~~ n/a | ~~FFS~~ Three sets of (carrier type, SCS) for the cells in the set for multi-cell PDSCH scheduling by DCI format 1\_3 with different SCS and/or different carrier type is not supported | ~~FFS~~ Per BC | ~~FFS~~ n/a | ~~FFS~~ n/a | ~~FFS~~ n/a | ~~FFS~~ | ~~FFS~~ Optional with capability signalling |

Proposal 1-8:

Update FG 66-2a as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 66-2a | Support of three sets of (carrier type, SCS) for the cells in the set for multi-cell PUSCH scheduling by DCI format 0\_3 with different SCS and/or different carrier type | ~~FFS~~  Supported applicable combinations of the following from the band combination:  - Three sets of (carrier type, SCS) for the cells in the set: {(FR1 licensed FDD, 15kHz), (FR1 licensed TDD, 30kHz), (FR2-1, 60kHz), (FR2-1, 120kHz)}  - A set of (carrier type, SCS) for scheduling cell: {(FR1 licensed FDD, 15kHz), (FR1 licensed TDD, 30kHz)} | ~~FFS~~ 66-2 | ~~FFS~~ Yes | ~~FFS~~ n/a | ~~FFS~~ Three sets of (carrier type, SCS) for the cells in the set for multi-cell PUSCH scheduling by DCI format 0\_3 with different SCS and/or different carrier type is not supported | ~~FFS~~ Per BC | ~~FFS~~ n/a | ~~FFS~~ n/a | ~~FFS~~ n/a | ~~FFS~~ | ~~FFS~~ Optional with capability signalling |

Proposal 1-9:

Introduce the following new FGs (inherit from Rel-18 FG 49-4a/4b/4c/4d):

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 66-5a | Nominal RBG size of Configuration 3 for FDRA type 0 for DCI format 1\_3 | 1) Support of nominal RBG size of Configuration 3 for FDRA type 0 for DCI format 1\_3 | 66-1 | Yes |  |  | Per UE | No | No | No |  | Optional with capability signaling |
| 66-5b | Nominal RBG size of Configuration 3 for FDRA type 0 for DCI format 0\_3 | 1) Support of nominal RBG size of Configuration 3 for FDRA type 0 for DCI format 0\_3 | 66-2 | Yes |  |  | Per UE | No | No | No |  | Optional with capability signaling |
| 66-5c | Configurable Type-1A fields for DCI format 0\_3/1\_3 | 1) Support Type-1A for ‘Antenna port(s)’ field for DCI format 1\_3  2) Support Type-1A for ‘Antenna port(s)’, ‘Precoding information and number of layers’ and ‘SRS resource indicator’ fields for DCI format 0\_3 | At least one of {66-1, 66-2} | Yes |  |  | Per UE | No | No | No |  | Optional with capability signaling |
| 66-5d | FDRA Type 1 granularity of 2, 4, 8, or 16 consecutive RBs based RIV for DCI format 1\_3/0\_3 | 1) Support of FDRA Type 1 granularity of 2, 4, 8, or 16 consecutive RBs based RIV for DCI format 0\_3  2) Support of FDRA Type 1 granularity of 2, 4, 8, or 16 consecutive RBs based RIV for DCI format 1\_3 | At least one of {66-1, 66-2} | Yes |  |  | Per UE | No | No | No |  | Optional with capability signaling |

Proposal 1-10:

Inform RAN2 to update prerequisite FG(s) for Rel-18 RAN1 FG 49-5a/5b/6/7/8/9/10/12/12a/13/14 in Rel-19 as follows (red fonts):

|  |  |  |  |
| --- | --- | --- | --- |
| Index | Feature group | Components | Prerequisite feature groups |
| 49-5a | Trigger Type 3 HARQ CB based feedback using DCI format 1\_3 | 1. Support feedback of type 3 HARQ-ACK codebook, triggered by a DCI 1\_3 scheduling at least a PDSCH  2. Support feedback of type 3 HARQ-ACK codebook, triggered by a DCI 1\_3 without scheduling a PDSCH using a reserved FDRA value | At least one of {49-1, 49-1b, 66-1} |
| 49-5b | Trigger enhanced Type 3 HARQ CB based feedback using DCI format 1\_3 | 1. Support feedback of enhanced type 3 HARQ-ACK codebook, triggered by a DCI 1\_3  2. Support configuration of up to 8 enhanced type 3 HARQ-ACK codebooks.  3. Support feedback of a dynamically selected enhanced type 3 HARQ-ACK codebook based on triggering information in DCI 1\_3  4. Support transmission of enhanced type 3 HARQ-ACK codebook using the first or second PUCCH configuration based on PHY priority indication in the triggering DCI (for a UE supporting two HARQ-ACK codebooks / PUCCH config in 49-6)  5. Supported maximum number of actual PUCCH transmissions for type 3 or enhanced type 3 HARQ-ACK codebook feedback within a slot | At least one of {49-1, 49-1b, 66-1} |
| 49-6 | Two HARQ-ACK codebooks with up to one sub-slot based HARQ-ACK codebook simultaneously constructed for supporting HARQ-ACK codebooks with different priorities by DCI format 1\_3 | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed with the restriction up to one sub-slot based HARQ-ACK codebook.  2. Supports separate PUCCH configuration for different HARQ-ACK codebooks.  3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.  4. Supports a DCI format 1\_3 scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_3/1\_3 is configured per BWP.  5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and 'codeBlockGroupTransmission" for different HARQ-ACK codebooks.  6. Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot   * Candidate values for the component 6 of this FG is: For NCP, {4, 5, 6, 7} for 2-symbol\*7 sub-slot configuration; For ECP, the candidate value is {4,5,6} for 2-symbol\*6 sub-slot configuration   7. Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK | At least one of {49-1, 49-1b, 66-1} |
| 49-7 | UL intra-UE multiplexing/prioritization of overlapping channel/signals with two priority levels in physical layer for DCI format 1\_3/0\_3 | Support intra-UE multiplexing/prioritization of overlapping PUCCH/PUCCH and PUCCH/PUSCH with two priority levels in physical layer (PHY) for DCI format 1\_3/0\_3  1) Configuration of PHY priority level for CG PUSCH and SR, and dynamic indication of priority level for dynamic PUSCH with a single DCI format 0\_3  2) Multiplexing/prioritization between UL channels/signals with the same PHY priority level  3) Prioritization between UL channels/signals with different PHY priority levels  4) Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.  5) Additional number of symbols (d2) of the preparation time needed for the high priority UL transmission that cancels a low priority UL transmission | At least one of {49-1, 49-1b, 49-2, 49-2b, 66-1, 66-2} |
| 49-8 | Triggered HARQ-ACK codebook re-transmission for DCI format 1\_3 | 1. Support HARQ-ACK re-transmission from an earlier PUCCH slot based on the triggering information in DCI format 1\_3  2. Support the related PHY priority handling in terms of HARQ-ACK codebook selection and the applicable PUCCH configuration (for a UE supporting two HARQ-ACK codebooks / PUCCH config in 49-6)  3. Supported minimum value M for the HARQ re-tx offset  4. Supported maximum value N for the HARQ re-tx offset | at least one of {49-1, 49-1b, 66-1} |
| 49-9 | SCell dormancy indication within active time in DCI format 0\_3/1\_3 | Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_3/1\_3 | 6-5, at least one of {49-1, 49-1b, 49-2,49-2b, 66-1, 66-2} |
| 49-10 | Dynamic indication of applicable minimum scheduling restriction by DCI format 0\_3/1\_3 | 1) Dynamic indication of applicable minimum scheduling restriction by DCI format 0\_3 and 1\_3  2) minimumSchedulingOffset K0 configuration for PDSCH and aperiodic CSI-RS triggering offset  3) minimumSchedulingOffset K2 configuration for PUSCH  4) Support of extended value range for aperiodic CSI-RS triggering offset | At least one of {49-1, 49-1b, 49-2,49-2b, 66-1, 66-2} |
| 49-12 | Unified TCI with joint DL/UL TCI update by DCI format 1\_3 for intra-cell and inter-cell beam management with more than one MAC-CE activated joint TCI state per CC | 1: TCI state indication for update and activation   1. MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_3 with DL assignment for at least one serving cell in a scheduledCellListDCI-1-3 to provide indicated unified TCI state(s) for the CC(s) in the scheduledCellListDCI-1-3)   2: The minimum beam application time in Y symbols per SCS  3: The maximum number of MAC-CE activated joint TCI states per CC in a band | 23-1-1, At least one of {49-1, 49-1b, 66-1} |
| 49-12a | Unified TCI with separate DL/UL TCI update by DCI format 1\_3 for intra-cell beam management with more than one MAC-CE activated separate TCI state per CC | 1. TCI state indication for update and activation 2. MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_3 with DL assignment for at least one serving cell in a scheduledCellListDCI-1-3 to provide indicated unified TCI state(s) for the CC(s) in the scheduledCellListDCI-1-3)   2. The minimum beam application time in Y symbols per SCS  3. The maximum number of MAC-CE activated DL TCI states per CC in a band  4. The maximum number of MAC-CE activated UL TCI states per CC in a band | 23-10-1, At least one of {49-1, 49-1b, 66-1} |
| 49-13 | Default QCL assumption for multi-cell scheduling by DCI format 1\_3 | Indicates whether the UE can be configured with enabledDefaultBeamFormultiCellScheduling for default QCL assumption for multi-cell scheduling by DCI format 1\_3 for same/different numerologies   * Candidate values are {different only, both}   + When "both" is reported, the UE supports this feature for same SCS and for different SCS combination(s) (low-to-high, high-to-low or both) reported for 49-1b | At least one of {49-1, 49-1b, 66-1} |
| 49-14 | Support of BWP switch indication by DCI format 0\_3/1\_3 | Support of BWP switch indication by DCI format 0\_3/1\_3 | At least one of {49-1, 49-1b, 49-2, 49-2b, 66-1, 66-2} for the BC  At least one of {6-2, 6-3, 6-4} for at least one band of the BC |

R1-2506886 UE features for MCE for NR Phase 3 vivo

R1-2506929 UE features for Rel-19 Multi-carrier enhancements Huawei, HiSilicon

R1-2506975 Discussion on UE feature for Rel-19 Multi-carrier enhancements Xiaomi

R1-2507078 NR Multi-carrier Enhancements Phase 2 UE features Nokia

R1-2507151 Discussion on UE feature for multi-cell scheduling with a single DCI OPPO

R1-2507198 Discussion on UE features for MCE for NR Phase 3 ZTE Corporation, Sanechips

R1-2507272 UE features for multi-carrier enhancements Samsung

R1-2507615 MCE UE features Phase 3 MediaTek Inc.

R1-2507662 Views on UE features for Rel-19 MCE Apple

R1-2507708 UE features for MCE for NR Phase 2 Qualcomm Incorporated

R1-2507801 Discussion on UE features for multi-cell PUSCH/PDSCH scheduling with a single DCI NTT DOCOMO, INC.

R1-2507860 UE features for MCE for NR Phase 3 Ericsson Inc.