**3GPP TSG-RAN WG1 Meeting #116-bis *R1-24xxxxx***

**Changsha, Hunan Province, China, April 15th – 19th, 2024**

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| *CR-Form-v12.2* |
| **DRAFT CHANGE REQUEST** |
|  |
|  | **38.214** | **CR** | **-** | **Rev** | **-** | **Current version:** | **18.2.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Corrections on enhanced reduced capability NR devices and on TDRA table of multicast PDSCH in RRC INACTIVE state |
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| ***Source to WG:*** | Nokia |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_redcap\_enh-Core, NR\_MBS\_enh-Core |  | ***Date:*** | 2024-04-26 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | In clause 5.1, maintenance on support for enhanced reduced capability NR devices.In clause 5.1.2.1.1, only Type0/0B CSS is supported for multicast MCCH/MTCH PDCCH in RRC\_INACTIVE state as specified in TS 38.213. However, multicast MCCH/MTCH in RRC\_INACTIVE state using the same entries as broadcast MCCH/MTCH in the definition of applicable resource allocation table used for PDSCH in TS 38.214, which may cause the ambiguity that Type 3 CSS is also supported for multicast MCCH/MTCH PDCCH in RRC\_INACTIVE state. |
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| ***Summary of change:*** | In clause 5.1 align RRC parameter names with TS 38.331 v18.0.0 in Clause 5.1; (replacing supportOfRedCap-r18 with supportOfERedCap and replacing FG 48-2 with eRedCapNotReducedBB-BW). 2. Remove return in middle of paragraph.In clause 5.1.2.1.1, separate the entries of applicable PDSCH time domain resource allocation table used for multicast MCCH/MTCH in RRC\_INACTIVE from broadcast MCCH/MTCH. |
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| ***Consequences if not approved:*** | Unclear or incomplete specification.  |
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| ***Clauses affected:*** | 5.1, 5.1.2.1.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | ... |
| ***affected:*** |  | **X** |  Test specifications | ... |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | ... |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<omitted text>

## 5.1 UE procedure for receiving the physical downlink shared channel

For downlink, a maximum of 16 HARQ processes per cell are supported by the UE, or subject to UE capability, a maximum of 32 HARQ processes per cell as defined in [13, TS 38.306]. The number of processes the UE may assume will at most be used for the downlink is configured to the UE for each cell separately by higher layer parameter *nrofHARQ-ProcessesForPDSCH* or *nrofHARQ-ProcessesForPDSCH-v1700*, and when no configuration is provided the UE may assume a default number of 8 processes.

A UE shall upon detection of a PDCCH with a configured DCI format 1\_0, 1\_1, 1\_2, 1\_3, 4\_0, 4\_1, or 4\_2 decode the corresponding PDSCHs as indicated by that DCI. When the UE is scheduled with multiple PDSCHs on a serving cell by a DCI, HARQ process ID indicated by this DCI applies to the first PDSCH not overlapping with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, HARQ process ID is then incremented by 1 for each subsequent PDSCH(s) in the scheduled order, with modulo operation of *nrofHARQ-ProcessesForPDSCH* applied if *nrofHARQ-ProcessesForPDSCH* is provided, or with modulo operation of *nrofHARQ-ProcessesForPDSCH-v1700* applied if or *nrofHARQ-ProcessesForPDSCH-v1700* is provided, or with modulo operation of 8 applied, otherwise. HARQ process ID is not incremented for PDSCH(s) not received if at least one of the symbols indicated by the indexed row of the used resource allocation table in the slot overlaps with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided. When a UE is configured by the higher layer parameter *repetitionScheme* set to 'tdmSchemeA', the PDSCH includes two PDSCH transmission occasions. For each PDSCH, if either PDSCH occasion overlaps with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, the PDSCH is not received and HARQ process ID is not increment for the PDSCH. For any HARQ process ID(s) in a given scheduled cell, the UE is not expected to receive a PDSCH that overlaps in time with another PDSCH if the UE is not capable of receiving FDMed unicast and multicast PDSCH per slot per carrier. When HARQ feedback for the HARQ process ID is not disabled, or for the HARQ process associated with the first SPS PDSCH when *HARQ-feedbackEnablingforSPSactive* is provided and enabled, the UE is not expected to receive another PDSCH for a given HARQ process until after the end of the expected transmission of HARQ-ACK for that HARQ process, where the timing is given by Clause 9.2.3 of [6, TS 38.213]. For HARQ-ACK subject to HARQ-ACK deferral described in Clause 9.2.5.4 of [6 TS 38.213], the expected transmission of HARQ-ACK corresponds to the expected transmission HARQ-ACK in a first slot. When HARQ feedback for the HARQ process ID is disabled, the UE is not expected to receive another PDCCH carrying a DCI scheduling a PDSCH or set of slot-aggregated PDSCH scheduled for the given HARQ process or to receive another PDSCH without corresponding PDCCH for the given HARQ process that starts until Tproc,1 after the end of the reception of the last PDSCH or slot-aggregated PDSCH for that HARQ process. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* in a given scheduled cell, the UE is not expected to receive a first PDSCH and a second PDSCH, starting later than the first PDSCH, with its corresponding HARQ-ACK assigned to be transmitted on a resource ending before the start of a different resource for the HARQ-ACK assigned to be transmitted for the first PDSCH, where the two resources are in different slots for the associated HARQ-ACK transmissions, each slot is composed of symbols [4] or a number of symbols indicated by *subslotLengthForPUCCH* if provided, and the HARQ-ACK for the two PDSCHs are associated with the HARQ-ACK codebook of the same priority. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* in a given scheduled cell, the UE is not expected to receive a first PDSCH, and a second PDSCH, starting later than the first PDSCH, with its corresponding HARQ-ACK assigned to be transmitted on a resource ending before the start of a different resource for the HARQ-ACK assigned to be transmitted for the first PDSCH if the HARQ-ACK for the two PDSCHs are associated with HARQ-ACK codebooks of different priorities. For any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start receiving a first PDSCH starting in symbol *j* by a PDCCH ending in symbol *i* on a scheduling cell, the UE is not expected to be scheduled to receive a PDSCH starting earlier than the end of the first PDSCH with a PDCCH that ends later than symbol *i* of a scheduling cell,. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], the PDCCH ending in symbol *i* is determined based on the PDCCH candidate that ends later in time. In a given scheduled cell, for any PDSCH corresponding to SI-RNTI, the UE is not expected to decode a re-transmission of an earlier PDSCH with a starting symbol less than *N* symbols after the last symbol of that PDSCH, where the value of *N* depends on the PDSCH subcarrier spacing configuration *μ,* with *N*=13 for *μ*=0, *N*=13 for *μ*=1, *N*=20 for *μ*=2, *N*=24 for *μ*=3, *N*=96 for *m*=5, and *N*=192 for *m*=6.

When receiving PDSCH scheduled with SI-RNTI, P-RNTI, G-RNTI for broadcast, MCCH-RNTI, G-RNTI for multicast in RRC\_INACTIVE state or multicast-MCCH-RNTI, the UE may assume that the DM-RS port of PDSCH is quasi co-located with the associated SS/PBCH block with respect to Doppler shift, Doppler spread, average delay, delay spread, spatial RX parameters when applicable.

When receiving PDSCH scheduled with RA-RNTI, or MSGB-RNTI, the UE may assume that the DM-RS port of PDSCH is quasi co-located with the SS/PBCH block or the CSI-RS resource the UE used for RACH association as applicable, and transmission with respect to Doppler shift, Doppler spread, average delay, delay spread, spatial RX parameters when applicable. When receiving a PDSCH scheduled with RA-RNTI in response to a random access procedure triggered by a PDCCH order which triggers contention-free random access procedure for the SpCell [10, TS 38.321], the UE may assume that the DM-RS port of the received PDCCH order and the DM-RS ports of the corresponding PDSCH scheduled with RA-RNTI are quasi co-located with the same SS/PBCH block or CSI-RS with respect to Doppler shift, Doppler spread, average delay, delay spread, spatial RX parameters when applicable. If a UE is configured with *SSB-MTC-AddtionalPCI* and with *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*, and if the UE is configured with [*twoTAGs*]for the SpCell, if the UE attempts to detect the DCI format 1\_0 with CRC scrambled by the corresponding RA-RNTI or when receiving a PDSCH scheduled with RA-RNTI in response to a random access procedure triggered by a PDCCH order which triggers contention-free random access procedure for the SpCell [10, TS 38.321], and if the CORESET used for the PDCCH order transmission is not associated with the serving cell physical cell ID, the UE may assume that the DM-RS ports of the received PDSCH are quasi co-located with the DM-RS antenna port associated with PDCCH receptions in the CORESET for Type1-PDCCH CSS set with respect to Doppler shift, Doppler spread, average delay, delay spread, and spatial RX parameters when applicable.

When receiving PDSCH in response to a PUSCH transmission scheduled by a RAR UL grant or corresponding PUSCH retransmission, or when receiving PDSCH in response to a PUSCH for Type-2 random access procedure, or a PUSCH scheduled by a fallbackRAR UL grant or corresponding PUSCH retransmission, the UE may assume that the DM-RS port of PDSCH is quasi co-located with the SS/PBCH block the UE selected for RACH association and transmission with respect to Doppler shift, Doppler spread, average delay, delay spread, spatial RX parameters when applicable.

If the UE is not configured for PUSCH/PUCCH transmission for at least one serving cell configured with slot formats comprised of DL and UL symbols, and if the UE is not capable of simultaneous reception and transmission on serving cell *c1*and serving cell *c2*, the UE is not expected to receive PDSCH on serving cell *c1* if the PDSCH overlaps in time with SRS transmission (including any interruption due to uplink or downlink RF retuning time [10]) on serving cell *c2* not configured for PUSCH/PUCCH transmission.

The UE is not expected to decode a PDSCH in a serving cell scheduled by a PDCCH with C-RNTI, CS-RNTI, MCS-C-RNTI, G-RNTI, G-CS-RNTI or MCCH-RNTI and one or multiple PDSCH(s) required to be received according to this Clause in the same serving cell without a corresponding PDCCH transmission if the PDSCHs partially or fully overlap in time except if the PDCCH scheduling the PDSCH ends at least 14$∙2^{max⁡(0,μ-3)}$ symbols before the earliest starting symbol of the PDSCH(s) without the corresponding PDCCH transmission, where *m* and the symbol duration are based on the smallest numerology between the scheduling PDCCH and the PDSCH, in which case the UE shall decode the PDSCH scheduled by the PDCCH. When the PDCCH reception incudes two PDCCH candidates from two respective search space sets, as described in clause 10 of [6, TS 38.213], for the purpose of determining the PDCCH with C-RNTI, CS-RNTI or MCS-C-RNTI scheduling the PDSCH ends at least 14$∙2^{max⁡(0,μ-3)}$ symbols before the earliest starting symbol of the PDSCH(s) without the corresponding PDCCH transmission, the PDCCH candidate that ends later in time is used.

The UE is not expected to decode a PDSCH scheduled with C-RNTI, MCS-C-RNTI, G-RNTI for multicast or broadcast, MCCH-RNTI, multicast-MCCH-RNTI, G-CS-RNTI or CS-RNTI if another PDSCH in the same cell scheduled with RA-RNTI or MSGB-RNTI partially or fully overlap in time.

Furthermore, a UE indicating *supportOfERedCap* capability but not indicating *eRedCapNotReducedBB-BW* is not expected to decode a PDSCH scheduled with C-RNTI, MCS-C-RNTI, G-RNTI for multicast or broadcast, MCCH-RNTI, multicast-MCCH-RNTI, G-CS-RNTI or CS-RNTI in the same or next slot if another PDSCH in the same cell is scheduled with RA-RNTI or MSGB-RNTI, when the PDSCH scheduled with RA-RNTI or MSGB-RNTI is allocated more than 25 PRBs when configured with SCS m = 0 or more than 12 PRBs when configured with SCS m = 1.

The UE in RRC\_IDLE and RRC\_INACTIVE modes shall be able to decode two PDSCHs each scheduled with SI-RNTI, P-RNTI, RA-RNTI or TC-RNTI, where the PDSCH scheduled with TC-RNTI for a reduced capability UE

that indicates *supportOfERedCap* is allocated no more than 25 PRBs when configured with SCS m = 0 or no more than 12 PRBs when configured with SCS m = 1, with the two PDSCHs partially or fully overlapping in time in non-overlapping PRBs.

The UE:

- is expected to decode PDSCH scheduled with MCCH-RNTI or multicast-MCCH-RNTI, and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.

- is not expected to decode PDSCH scheduled with G-RNTI for broadcast and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.

- is not expected to decode PDSCH scheduled with G-RNTI for multicast and PBCH in PCell that partially or fully overlaps in time in non-overlapping PRBs in PCell.

On a frequency range 1 cell, the UE shall be able to decode a PDSCH scheduled with C-RNTI, MCS-C-RNTI, or CS-RNTI and, during a process of P-RNTI triggered SI acquisition, another PDSCH scheduled with SI-RNTI that partially or fully overlap in time in non-overlapping PRBs, unless the PDSCH scheduled with C-RNTI, MCS-C-RNTI, or CS-RNTI requires Capability 2 processing time according to clause 5.3 in which case the UE may skip decoding of the scheduled PDSCH with C-RNTI, MCS-C-RNTI, or CS-RNTI.

On a frequency range 2 cell, the UE is not expected to decode a PDSCH scheduled with C-RNTI, MCS-C-RNTI, or CS-RNTI if in the same cell, during a process of P-RNTI triggered SI acquisition, another PDSCH scheduled with SI-RNTI partially or fully overlap in time.

A UE that indicates *supportOfRedCap-r18* capability but does not indicate *eRedCapNotReducedBB-BW*, during a process of P-RNTI triggered SI acquisition, when the total number of PRBs for the PDSCH scheduled with SI-RNTI and the PDSCH scheduled with C-RNTI, MCS-C-RNTI, or CS-RNTI scheduled in the slot is larger than 25 PRBs if configured with SCS µ = 0 or larger than 12 PRBs if configured with SCS µ = 1, the UE may skip decoding of the scheduled PDSCH with C-RNTI, MCS-C-RNTI, or CS-RNTI.

The UE is expected to decode a PDSCH scheduled with C-RNTI, MCS-C-RNTI, or CS-RNTI during a process of autonomous SI acquisition.

The maximum number of PDSCHs scheduled per slot per component carrier with C-RNTI/CS-RNTI and G-RNTI/G-CS-RNTI/MCCH-RNTI/multicast-MCCH-RNTI that the UE shall be able to decode is the same as the indicated UE capability for the number of unicast PDSCHs per slot per component carrier. If the UE is capable of receiving FDMed unicast and multicast PDSCH per slot per carrier, the UE shall be able to decode a PDSCH scheduled by a DCI format with C-RNTI or a PDSCH scheduled for a retransmission of a TB by a DCI format with CS-RNTI and a PDSCH scheduled by a DCI format with G-RNTI for multicast or a PDSCH scheduled for a retransmission of a TB by a DCI format with G-CS-RNTI that partially or fully overlap in time in non-overlapping PRBs. If the UE is capable of receiving FDMed unicast and broadcast PDSCH per slot per carrier, the UE shall be able to decode a PDSCH scheduled by a DCI format with C-RNTI or a PDSCH scheduled for a retransmission of a TB by a DCI format with CS-RNTI and a PDSCH scheduled with G-RNTI for broadcast/MCCH-RNTI that partially or fully overlap in time in non-overlapping PRBs. For a reduced capability UE that indicates *supportOfERedCap* but not indicating *eRedCapNotReducedBB-BW*, if the UE is capable of receiving FDMed unicast and multicast/broadcast PDSCH per slot, the UE can decode the two PDSCHs, with the two PDSCHs partially or fully overlapping in time in non-overlapping PRBs,

- if the total number of PRBs allocated is no more than 25 PRBs when configured with SCS m = 0 or no more than 12 PRBs when configured with SCS m = 1,

- otherwise, the UE may skip decoding one of the two PDSCHs.

If the UE is configured by higher layers to decode a PDCCH with its CRC scrambled by a CS-RNTI or G-CS-RNTI, the UE shall receive PDSCH transmissions without corresponding PDCCH transmissions using the higher-layer-provided PDSCH configuration for those PDSCHs.

The UE is not expected to support reception of:

- FDMed broadcast MCCH PDSCH and broadcast MTCH PDSCH in PCell or SCell, or

- FDMed multiple broadcast MTCH PDSCHs in PCell or SCell, or

- FDMed broadcast MCCH/broadcast MTCH/multicast PDSCH and SIB PDSCH in PCell, or

- FDMed multicast PDSCHs in PCell or SCell, or

- FDMed multicast PDSCH and MCCH/broadcast MTCH PDSCH in PCell or SCell, or

- FDMed broadcast MCCH/broadcast MTCH/multicast PDSCH and paging PDSCH.

The UE in RRC\_INACTIVE state is not expected to support reception of:

- FDMed multicast MCCH PDSCH and multicast MTCH PDSCH in Pcell, or

- FDMed multiple multicast MTCH PDSCHs in Pcell, or

- FDMed broadcast MCCH/broadcast MTCH/multicast MCCH/multicast MTCH and SIB PDSCH in Pcell, or

- FDMed multicast MCCH/multicast MTCH and broadcast MCCH/broadcast MTCH in Pcell, or

- FDMed multicast MCCH/multicast MTCH and paging PDSCH in Pcell.

If a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*, the UE may expect to receive multiple PDCCHs scheduling fully/partially/non-overlapped PDSCHs in time and frequency domain. The UE may expect the reception of full/partially-overlapped PDSCHs in time, only when PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex*. For a *ControlResourceSet* without *coresetPoolIndex*, the UE may assume that the *ControlResourceSet* is assigned with *coresetPoolIndex* as 0. When the UE is configured with *SSB-MTC-AdditionalPCI*, *ControlResourceSets* corresponding to different *coresetPoolIndex* values may be associated with different physical cell IDs via activated TCI states of the *ControlResourceSets*, where *ControlResourceSets* corresponding to one *coresetPoolIndex* is associated with the serving cell physical cell ID and *ControlResourceSets* corresponding to another *coresetPoolIndex* can be associated with another physical cell ID. When the UE is scheduled with full/partially/non-overlapped PDSCHs in time and frequency domain, the full scheduling information for receiving a PDSCH is indicated and carried only by the corresponding PDCCH, the UE is expected to be scheduled with the same active BWP and the same SCS. When the UE is scheduled with full/partially-overlapped PDSCHs in time and frequency domain, the UE can be scheduled with at most two codewords simultaneously. When PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* the following operations are allowed:

- For any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start receiving a first PDSCH starting in symbol *j* by a PDCCH associated with a value of *coresetPoolIndex* ending in symbol *i*, the UE can be scheduled to receive a PDSCH starting earlier than the end of the first PDSCH with a PDCCH associated with a different value of *coresetPoolIndex* that ends later than symbol *i*.

- In a given scheduled cell, the UE can receive a first PDSCH in slot *i*, with the corresponding HARQ-ACK assigned to be transmitted in slot *j*, and a second PDSCH associated with a value of *coresetPoolIndex* different from that of the first PDSCH starting later than the first PDSCH with its corresponding HARQ-ACK assigned to be transmitted in a slot before slot *j*.

If PDCCHs that schedule corresponding PDSCHs are associated to the same or different *ControlResourceSets* having the same value of *coresetPoolIndex*, the UE procedure for receiving the PDSCH upon detection of a PDCCH follows Clause 5.1.

A UE does not expect to be configured with *repetitionScheme* if the UE is configured with higher layer parameter *repetitionNumber* for the same PDSCH.

When a UE is configured by higher layer parameter *repetitionScheme* set to one of 'fdmSchemeA*'*, 'fdmSchemeB*'*, 'tdmSchemeA*'*, if the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* or if the UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI States to be applied to PDSCH and the UE is indicated with DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)'*.

- When the UE is set to 'fdmSchemeA*',* the UE shall receive a single PDSCH transmission occasion of the TB with each TCI state associated to a non-overlapping frequency domain resource allocation as described in Clause 5.1.2.3.

- When the UE is set to 'fdmSchemeB*'*, the UE shall receive two PDSCH transmission occasions of the same TB with each TCI state associated to a PDSCH transmission occasion which has non-overlapping frequency domain resource allocation with respect to the other PDSCH transmission occasion as described in Clause 5.1.2.3.

- When the UE is set to 'tdmSchemeA*'*, the UE shall receive two PDSCH transmission occasions of the same TB with each TCI state associated to a PDSCH transmission occasion which has non-overlapping time domain resource allocation with respect to the other PDSCH transmission occasion and both PDSCH transmission occasions shall be received within a given slot as described in Clause 5.1.2.1.

When a UE is configured by the higher layer parameter *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, the UE not configured with *dl-OrJointTCI-StateList* may expect to be indicated with one or two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* or when the UE configured with *dl-OrJointTCI-StateList* may expect to apply one or two indicated TCI states to the PDSCH, together with the DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation* and DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)'*.

- When two TCI states are indicated in a DCI with '*Transmission Configuration Indication*' field for the UE not configured with *dl-OrJointTCI-StateList*, or when the UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI States to be applied to PDSCH, the UE may expect to receive multiple slot level PDSCH transmission occasions of the same TB with two TCI states used across multiple PDSCH transmission occasions in the *repetitionNumber* consecutive slots as defined in Clause 5.1.2.1.

- When one TCI state is indicated in a DCI with '*Transmission Configuration Indication*' field for the UE not configured with *dl-OrJointTCI-StateList*, or when the UE configured with *dl-OrJointTCI-StateList* is having one indicated TCI states to be applied to PDSCH, the UE may expect to receive multiple slot level PDSCH transmission occasions of the same TB with one TCI state used across multiple PDSCH transmission occasions in the *repetitionNumber* consecutive slots as defined in Clause 5.1.2.1.

When a UE is not indicated with a DCI that DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, and it is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* for the UE not configured with *dl-OrJointTCI-StateList*, or when the UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI States to be applied to PDSCH, and is indicated with DM-RS port(s) within two CDM groups in the DCI field '*Antenna Port(s)'* and it is not configured with higher layer parameter *sfnSchemePDSCH*, the UE may expect to receive a single PDSCH where the association between the DM-RS ports and the TCI states are as defined in Clause 5.1.6.2.

When a UE is not indicated with a DCI that DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, and it is not configured with *dl-OrJointTCI-StateList* and is indicated with one TCI states in a codepoint of the DCI field *'Transmission Configuration Indication',* or it is configured with *dl-OrJointTCI-StateList* and is expected to apply one indicated TCI states to PDSCH, the UE procedure for receiving the PDSCH upon detection of a PDCCH follows Clause 5.1.

When a UE is configured with higher layer parameter *sfnSchemePDSCH* set to either *'*sfnSchemeA*'* or *'*sfnSchemeB*'* and

- if the UE reports its capability of *sfn-SchemeA-DynamicSwitching* or *sfn-SchemeB-DynamicSwitching*, the UE not configured with *dl-OrJointTCI-StateList* is indicated with one or two TCI state(s) in a codepoint of the DCI field *'Transmission Configuration Indication'* in DCI format 1\_1/1\_2, or the UE configured with *dl-OrJointTCI-StateList* is having one or two indicated TCI States to be applied to PDSCH

- otherwise, the UE not configured with *dl-OrJointTCI-StateList* is not expected to be indicated with one TCI state per any of TCI codepoint by MAC CE, and the UE is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* in DCI format 1\_1/1\_2, or the UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI States to be applied to PDSCH

the UE procedure for receiving the PDSCH upon detection of a PDCCH follows clause 5.1 and the QCL assumption for the PDSCH as defined in clause 5.1.5.

When a UE is configured with both *sfnSchemePDSCH* and *sfnSchemePDCCH*, the UE shall expect that *sfnSchemePDSCH* and *sfnSchemePDCCH* are set to the same scheme, either *'*sfnSchemeA*'* or *'*sfnSchemeB*'*.

If a UE not configured with *dl-OrJointTCI-StateList* is configured with *sfnSchemePDCCH* set to 'sfnSchemeA' and activated with two TCI states by MAC CE, and the UE does not report its capability of *sfn-SchemeA-PDCCH-only*, the UE is expected to be configured with *sfnSchemePDSCH* set to *'sfnSchemeA'* and indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication',* if the PDSCH is scheduled by DCI format 1\_1/1\_2.

If a UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is configured with *sfnSchemePdcch* set to 'sfnSchemeA' for a DL BWP and signaled by the higher layer parameter [applyIndicatedTCIState] to apply both indicated TCI-States to a PDCCH on a CORESET, and the UE does not report its capability of *sfn-SchemeA-PDCCH-only*, the UE is expected to be configured with *sfnSchemePdsch* set to *'sfnSchemeA'* and both indicated TCI-States are applicable to PDSCH, if the PDSCH is scheduled by DCI format 1\_1/1\_2 on the PDCCH.

If a UE not configured with *dl-OrJointTCI-StateList* is configured with *sfnSchemePDCCH* set to 'sfnSchemeB' and activated with two TCI states by MAC CE, the UE is expected to be configured with *sfnSchemePDSCH* set to *'sfnSchemeB'* and indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication',* if the PDSCH is scheduled by DCI format 1\_1/1\_2.

If a UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is configured with *sfnSchemePdcch* set to 'sfnSchemeB' for a DL BWP, and signaled by the higher layer parameter [applyIndicatedTCIState] to apply both indicated TCI-States to a PDCCH on a CORESET, the UE is expected to be configured with *sfnSchemePdsch* set to *'sfnSchemeB'* and both indicated TCI-States are applicable to PDSCH*,* if the PDSCH is scheduled by DCI format 1\_1/1\_2 on the PDCCH.

When a UE is configured with *sfnSchemePDSCH* and/or *sfnSchemePDCCH*, the UE shall expect that the *sfnSchemePDSCH* and/or *sfnSchemePDCCH* configuration are the same within a CC, and the UE shall expect that the *sfnSchemePDSCH* and/or *sfnSchemePDCCH* configuration are the same in all CCs in a same frequency band if the UE is configured with CA, where the UE does not expect to be configured with *sfnSchemePDSCH* and/or *sfnSchemePDCCH* in initial BWP in each CC.

If more than one PDSCH on a serving cell each without a corresponding PDCCH transmission are in a slot, after resolving overlapping with symbols in the slot indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or by *tdd-UL-DL-ConfigurationDedicated*, or determined as non-active periods of cell DTX, if the serving cell is activated with cell DTX, based on [10, TS 38.321], a UE receives one or more PDSCHs without corresponding PDCCH transmissions in the slot as specified below.

‒ Step 0: set *j=0*, where *j* is thenumber of selected PDSCH(s) for decoding. *Q* is the set of activated PDSCHs without corresponding PDCCH transmissions within the slot

‒ Step 1: A UE receives one PDSCH with the lowest configured *sps-ConfigIndex* within *Q*, set *j=j+1*. Designate the received PDSCH as survivor PDSCH.

‒ Step 2: The survivor PDSCH in step 1 and any other PDSCH(s) overlapping (even partially) with the survivor PDSCH in step 1 are excluded from *Q*.

‒ Step 3: Repeat step 1 and 2 until *Q* is empty or *j* is equal to the number of unicast/multicast PDSCHs in a slot supported by the UE.

For a cell detected in cell search procedure with synchronization raster defined in Table 5.4.3.1-2 or Table 5.4.3.1-3 of [8, TS 38.101-1], the size of CORESET 0 for the cell in this clause refers to the size of punctured CORESET 0 as defined in clause 7.3.2.2 of [4, TS 38.211] if any.

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##### 5.1.2.1.1 Determination of the resource allocation table to be used for PDSCH

Table 5.1.2.1.1-1 and Table 5.1.2.1.1-1A define which PDSCH time domain resource allocation configuration to apply. Either a default PDSCH time domain allocation A, B or C according to tables 5.1.2.1.1-2, 5.1.2.1.1-3, 5.1.2.1.1-4 and 5.1.2.1.1-5 is applied, or the higher layer configured *pdsch-TimeDomainAllocationList* or *pdsch-TimeDomainAllocationListForMultiPDSCH* or *pdsch-TimeDomainAllocationListDCI-1-2* is applied. For operation with shared spectrum channel access in frequency range 1, as described in [16, TS 37.213], UE reinterprets *S* and *L* in row 9 of Table 5.1.2.1.1-2 as *S=6* and *L=7*.

Table 5.1.2.1.1-1: Applicable PDSCH time domain resource allocation for DCI formats 1\_0, 1\_1, 1\_3, 4\_0, 4\_1 and 4\_2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **RNTI** | **PDCCH search space** | **SS/PBCH block and CORESET multiplexing pattern** | ***PDSCH-ConfigCommon* includes *pdsch-TimeDomainAllocationList*** | ***PDSCH-Config* includes *pdsch-TimeDomainAllocationList*** | ***pdsch-ConfigMCCH / pdsch-ConfigMTCH*  includes *pdsch-TimeDomainAllocationList******Or*** ***pdsch-ConfigMulticast* includes *pdsch-TimeDomainAllocationList*** | ***PDSCH-Config* includes *pdsch-TimeDomainAllocationListForMultiPDSCH*** | **PDSCH time domain resource allocation to apply** |
| SI-RNTI | Type0 common | 1 | - | - | - | - | Default A for normal CP |
| 2 | - | - | - | - | Default B |
| 3 | - | - | - | - | Default C |
| SI-RNTI | Type0A common | 1 | No | - | - | - | Default A |
| 2 | No | - | - | - | Default B |
| 3 | No | - | - | - | Default C |
| 1,2,3 | Yes | - | - | - | *Pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| RA-RNTI, MSGB-RNTI, TC-RNTI | Type1 common | 1,2,3 | No | - | - | - | Default A |
| 1,2,3 | Yes | - | - | - | *Pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| P-RNTI | Type2 common | 1 | No | - | - | - | Default A |
| 2 | No | - | - | - | Default B |
| 3 | No | - | - | - | Default C |
| 1,2,3 | Yes | - | - | - | *Pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| MCCH-RNTI,  | Type 0/0B/3 common for broadcast  | 1 | No | - | No | *-* | Default A |
| 2 | No | - | No | *-* | Default B |
| 3 | No | - | No | *-* | Default C |
| 1,2,3 | Yes | - | No | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| 1,2,3 | No/Yes | - | Yes | *-* | *pdsch-TimeDomainAllocationList provided in pdsch-ConfigMCCH* |
| multicast-MCC-RNTI | Type 0/0B common for multicast | 1 | No | - | No | *-* | Default A |
| 2 | No | - | No | *-* | Default B |
| 3 | No | - | No | *-* | Default C |
| 1,2,3 | Yes | - | No | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| 1,2,3 | No/Yes | - | Yes | *-* | *pdsch-TimeDomainAllocationList provided in pdsch-ConfigMCCH* |
| G-RNTI for broadcast  | Type 0/0B/3 common for broadcast  | 1 | No | - | No | *-* | Default A |
| 2 | No | - | No | *-* | Default B |
| 3 | No | - | No | *-* | Default C |
| 1,2,3 | Yes | - | No | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| 1,2,3 | No/Yes | - | Yes | *-* | *pdsch-TimeDomainAllocationList* provided in *pdsch-ConfigMTCH,* if configured, otherwise *pdsch-TimeDomainAllocationList* provided in *pdsch-ConfigMCCH* |
| G-RNTI for multicast in RRC\_INACTIVE  | Type 0/0B common for multicast  | 1 | No | - | No | *-* | Default A |
| 2 | No | - | No | *-* | Default B |
| 3 | No | - | No | *-* | Default C |
| 1,2,3 | Yes | - | No | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| 1,2,3 | No/Yes | - | Yes | *-* | *pdsch-TimeDomainAllocationList* provided in *pdsch-ConfigMTCH,* if configured, otherwise *pdsch-TimeDomainAllocationList* provided in *pdsch-ConfigMCCH* |
| C-RNTI, MCS-C-RNTI, CS-RNTI | Any common search space associated with CORESET 0 | 1, 2, 3 | No | - | - | - | Default A |
| 1, 2, 3 | Yes | - | - | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon* |
| C-RNTI, MCS-C-RNTI, CS-RNTI | Any common search space not associated with CORESET 0UE specific search space | 1,2,3 | No | No | - | - | Default A |
| 1,2,3 | Yes | No | - | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon*  |
| 1,2,3 | No/Yes | Yes | - | *-* | *pdsch-TimeDomainAllocationList* provided in *PDSCH-Config* |
| 1,2,3 | No/Yes | - | - | Yes | *pdsch-TimeDomainAllocationListForMultiPDSCH* provided in *PDSCH-Config (Note 2)* |
| G-RNTI for multicast, G-CS-RNTI  | Type 3 common search space for multicast | 1,2,3 | No | - | No | - | *Default A* |
| 1,2,3 | Yes | - | No | - | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon (Note 1)* |
| 1,2,3 | No/Yes | - | Yes | - | *pdsch-TimeDomainAllocationList* provided in *pdsch-ConfigMulticast**(Note 1)* |
| Note 1: For a UE that supports multicast, the same TDRA table applies to all G-RNTIs and G-CS-RNTIs (configured for multicast) if configured on a given serving cell.Note 2: If *pdsch-TimeDomainAllocationListForMultiPDSCH* is provided, it is applicable to DCI format 1\_1 only. |

Table 5.1.2.1.1-1A: Applicable PDSCH time domain resource allocation for DCI format 1\_2

|  |  |  |  |
| --- | --- | --- | --- |
| *PDSCH-ConfigCommon* includes *pdsch-TimeDomainAllocationList* | *PDSCH-Config includes pdsch-TimeDomainAllocationList* | *PDSCH-Config* includes *pdsch- TimeDomainAllocationListDCI-1-2* | PDSCH time domain resource allocation to apply |
| No | No | No | Default A |
| Yes | No | No | *pdsch-TimeDomainAllocationList* provided in *PDSCH-ConfigCommon*  |
| No/Yes | Yes | No | *pdsch-TimeDomainAllocationList* provided in *PDSCH-Config* |
| No/Yes | No/Yes | Yes | *pdsch-TimeDomainAllocationListDCI-1-2* provided in *PDSCH-Config* |

Table 5.1.2.1.1-2: Default PDSCH time domain resource allocation A for normal CP

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Row index | *dmrs-TypeA-Position* | PDSCH mapping type | *K0* | *S* | *L* |
| 1 | 2 | Type A | 0 | 2 | 12 |
| 3 | Type A | 0 | 3 | 11 |
| 2 | 2 | Type A | 0 | 2 | 10 |
| 3 | Type A | 0 | 3 | 9 |
| 3 | 2 | Type A | 0 | 2 | 9 |
| 3 | Type A | 0 | 3 | 8 |
| 4 | 2 | Type A | 0 | 2 | 7 |
| 3 | Type A | 0 | 3 | 6 |
| 5 | 2 | Type A | 0 | 2 | 5 |
| 3 | Type A | 0 | 3 | 4 |
| 6 | 2 | Type B | 0 | 9 | 4 |
| 3 | Type B | 0 | 10 | 4 |
| 7 | 2 | Type B | 0 | 4 | 4 |
| 3 | Type B | 0 | 6 | 4 |
| 8 | 2,3 | Type B | 0 | 5 | 7 |
| 9 | 2,3 | Type B | 0 | 5 | 2 |
| 10 | 2,3 | Type B | 0 | 9 | 2 |
| 11 | 2,3 | Type B | 0 | 12 | 2 |
| 12 | 2,3 | Type A | 0 | 1 | 13 |
| 13 | 2,3 | Type A | 0 | 1 | 6 |
| 14 | 2,3 | Type A | 0 | 2 | 4 |
| 15 | 2,3 | Type B | 0 | 4 | 7 |
| 16 | 2,3 | Type B | 0 | 8 | 4 |

Table 5.1.2.1.1-3: Default PDSCH time domain resource allocation A for extended CP

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Row index | *dmrs-TypeA-Position* | PDSCH mapping type | *K0* | *S* | *L* |
| 1 | 2 | Type A | 0 | 2 | 6 |
| 3 | Type A | 0 | 3 | 5 |
| 2 | 2 | Type A | 0 | 2 | 10 |
| 3 | Type A | 0 | 3 | 9 |
| 3 | 2 | Type A | 0 | 2 | 9 |
| 3 | Type A | 0 | 3 | 8 |
| 4 | 2 | Type A | 0 | 2 | 7 |
| 3 | Type A | 0 | 3 | 6 |
| 5 | 2 | Type A | 0 | 2 | 5 |
| 3 | Type A | 0 | 3 | 4 |
| 6 | 2 | Type B | 0 | 6 | 4 |
| 3 | Type B | 0 | 8 | 2 |
| 7 | 2 | Type B | 0 | 4 | 4 |
| 3 | Type B | 0 | 6 | 4 |
| 8 | 2,3 | Type B | 0 | 5 | 6 |
| 9 | 2,3 | Type B | 0 | 5 | 2 |
| 10 | 2,3 | Type B | 0 | 9 | 2 |
| 11 | 2,3 | Type B | 0 | 10 | 2 |
| 12 | 2,3 | Type A | 0 | 1 | 11 |
| 13 | 2,3 | Type A | 0 | 1 | 6 |
| 14 | 2,3 | Type A | 0 | 2 | 4 |
| 15 | 2,3 | Type B | 0 | 4 | 6 |
| 16 | 2,3 | Type B | 0 | 8 | 4 |

Table 5.1.2.1.1-4: Default PDSCH time domain resource allocation B

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Row index** | ***dmrs-TypeA-Position*** | **PDSCH mapping type** | ***K0*** | ***S*** | ***L*** |
| 1 | 2,3 | Type B | 0 | 2 | 2 |
| 2 | 2,3 | Type B | 0 | 4 | 2 |
| 3 | 2,3 | Type B | 0 | 6 | 2 |
| 4 | 2,3 | Type B | 0 | 8 | 2 |
| 5 | 2,3 | Type B | 0 | 10 | 2 |
| 6 | 2,3 | Type B | 1 | 2 | 2 |
| 7 | 2,3 | Type B | 1 | 4 | 2 |
| 8 | 2,3 | Type B | 0 | 2 | 4 |
| 9 | 2,3 | Type B | 0 | 4 | 4 |
| 10 | 2,3 | Type B | 0 | 6 | 4 |
| 11 | 2,3 | Type B | 0 | 8 | 4 |
| 12 (Note 1) | 2,3 | Type B | 0 | 10 | 4 |
| 13 (Note 1) | 2,3 | Type B | 0 | 2 | 7 |
| 14 (Note 1) | 2 | Type A | 0 | 2 | 12 |
| 3 | Type A | 0 | 3 | 11 |
| 15  | 2,3 | Type B | 1 | 2 | 4 |
| 16 | Reserved |
| Note 1: If the PDSCH was scheduled with SI-RNTI in PDCCH Type0 common search space, the UE may assume that this PDSCH resource allocation is not applied |

Table 5.1.2.1.1-5: Default PDSCH time domain resource allocation C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Row index** | ***dmrs-TypeA-Position*** | **PDSCH mapping type** | ***K0*** | ***S*** | ***L*** |
| 1 (Note 1) | 2,3 | Type B | 0 | 2 | 2 |
| 2  | 2,3 | Type B | 0 | 4 | 2 |
| 3 | 2,3 | Type B | 0 | 6 | 2 |
| 4 | 2,3 | Type B | 0 | 8 | 2 |
| 5 | 2,3 | Type B | 0 | 10 | 2 |
| 6 (Note 2) | 2,3 | Type B | 0 | 11 | 2 |
| 7 | Reserved |
| 8 | 2,3 | Type B | 0 | 2 | 4 |
| 9 | 2,3 | Type B | 0 | 4 | 4 |
| 10 | 2,3 | Type B | 0 | 6 | 4 |
| 11 | 2,3 | Type B | 0 | 8 | 4 |
| 12 | 2,3 | Type B | 0 | 10 | 4 |
| 13 (Note 1) | 2,3 | Type B | 0 | 2 | 7 |
| 14 (Note 1) | 2 | Type A | 0 | 2 | 12 |
| 3 | Type A | 0 | 3 | 11 |
| 15 (Note 1) | 2,3 | Type A | 0 | 0 | 6 |
| 16 (Note 1) | 2,3 | Type A | 0 | 2 | 6 |
| Note 1: The UE may assume that this PDSCH resource allocation is not used, if the PDSCH was scheduled with SI-RNTI in PDCCH Type0 common search spaceNote 2: This applies for Case F and Case G candidate SS/PBCH block pattern described in clause 4 of [6, TS 38.213] |

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