**3GPP TSG-RAN WG2 Meeting #117-e *R2-2203825***

**Online, 21 February – 03 March 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** | **1209** | **rev** | **1** | **Current version:** | **16.7.0** |  |
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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:***  | Clarification on the initial state of elements controlled by MAC CE |
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| ***Source to WG:*** | Huawei, HiSilicon, ZTE Corporation |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core, TEI16 |  | ***Date:*** | 2022-02-21 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-16 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In the current MAC spec, for semi-persistent CSI/RS/CSI-IM resource sets, semi-persistent SRS resource sets, semi-persistent CSI reporting on PUCCH, semi-persistent ZP CSI-RS resource sets, semi-persistent Positioning SRS and UE-specific PDSCH TCI states, which can be activated and deactivated by the corresponding MAC CEs, the initial status are “deactivated” upon configuration and after a handover (see subclause 5.18.2 of activation/deactivation of semi-persistent CSI-RS/CSI-IM resource set as example below)5.18.2 Activation/Deactivation of Semi-persistent CSI-RS/CSI-IM resource setThe network may activate and deactivate the configured Semi-persistent CSI-RS/CSI-IM resource sets of a Serving Cell by sending the SP CSI-RS/CSI-IM Resource Set Activation/Deactivation MAC CE described in clause 6.1.3.12. The configured Semi-persistent CSI-RS/CSI-IM resource sets are initially deactivated upon configuration and after a handover.Above semi-persistent resources and indications can be initially configured by RRC and reconfigured by RRC and continued to use after PCell change (for MCG only) and PSCell change (for SCG only), and thus the MAC handling of the activation status should be consistent for all relevant procedures. However, the current MAC spec is still incomplete by not capturing the reconfiguration and PSCell change cases and the case of (Enhanced) Activation/Deactivation of spatial relation of PUCCH resource.In RAN2#115e, this issue was discussed and an LS was sent to check with RAN1. In the reply LS (R1-2112860), it was confirmed by RAN1 and RAN2 further agreed in RAN2#117e that 1. the initial state of the elements controlled by the relevant MAC CEs is applied to both PCell change and PSCell change/addition, and2. configuration covers the cases of initial configuration and reconfiguration by RRC, and3. also confirmed that (Enhanced) PUCCH spatial relation activation/deactivation MAC CE is consistent with other MAC CEs. Therefore, the R16 MAC spec needs to be updated accordingly. |
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| ***Summary of change:*** | 1. In subcaluse 5.18, to clarify that “the configured CSI/RS/CSI-IM resource sets, semi-persistent SRS resource sets, semi-persistent CSI reporting on PUCCH, semi-persistent ZP CSI-RS resource sets, semi-persistent Positioning SRS and (Enhanced) UE-specific PDSCH TCI states are **initially deactivated after reconfiguration with sync.**2. In subcaluse 5.18, to clarify that “the configured CSI/RS/CSI-IM resource sets, semi-persistent SRS resource sets, semi-persistent CSI reporting on PUCCH, semi-persistent ZP CSI-RS resource sets, semi-persistent Positioning SRS and (Enhanced) UE-specific PDSCH TCI states are **initially deactivated** **upon (re-)configuration by upper layers**.3. In subcaluse 5.18, to clarify that “the configured (Enhanced) PUCCH spatial relation of PUCCH resource is **initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.****Impact analysis**Impacted 5G architecture options: NR-SA, MR-DCImpacted functionality: Handling of MAC CEsInter-operability:If the UE is implemented according to this CR while the network is not, there is risk that network is not clear whether the UE has automatically “deactivated” the relevant resource sets and indications. If the network is implemented according to this CR while the UE is not, there is is risk that the UE has not automatically “deactivated” the relevant resource sets and indications upon reconfiguration and PSCell change (for SCG only).. |
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| ***Consequences if not approved:*** | The UE may not automatically “deactivate” the semi-persistent resource sets and indications which can be activated and deactivated by MAC CE. |
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| ***Clauses affected:*** | 5.18 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*START OF CHANGES*

## 5.18 Handling of MAC CEs

### 5.18.1 General

This clause specifies the requirements upon reception of the following MAC CEs:

- SP CSI-RS/CSI-IM Resource Set Activation/Deactivation MAC CE;

- Aperiodic CSI Trigger State Subselection MAC CE;

- TCI States Activation/Deactivation for UE-specific PDSCH MAC CE;

- TCI State Indication for UE-specific PDCCH MAC CE;

- SP CSI reporting on PUCCH Activation/Deactivation MAC CE;

- SP SRS Activation/Deactivation MAC CE;

- PUCCH spatial relation Activation/Deactivation MAC CE;

- Enhanced PUCCH spatial relation Activation/Deactivation MAC CE;

- SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE;

- Recommended Bit Rate MAC CE;

- Enhanced SP/AP SRS Spatial Relation Indication MAC CE;

- SRS Pathloss Reference RS Update MAC CE;

- PUSCH Pathloss Reference RS Update MAC CE;

- Serving Cell set based SRS Spatial Relation Indication MAC CE;

- SP Positioning SRS Activation/Deactivation MAC CE;

- Timing Delta MAC CE;

- Guard Symbols MAC CEs.

### 5.18.2 Activation/Deactivation of Semi-persistent CSI-RS/CSI-IM resource set

The network may activate and deactivate the configured Semi-persistent CSI-RS/CSI-IM resource sets of a Serving Cell by sending the SP CSI-RS/CSI-IM Resource Set Activation/Deactivation MAC CE described in clause 6.1.3.12. The configured Semi-persistent CSI-RS/CSI-IM resource sets are initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives an SP CSI-RS/CSI-IM Resource Set Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the SP CSI-RS/CSI-IM Resource Set Activation/Deactivation MAC CE.

### 5.18.3 Aperiodic CSI Trigger State Subselection

The network may select among the configured aperiodic CSI trigger states of a Serving Cell by sending the Aperiodic CSI Trigger State Subselection MAC CE described in clause 6.1.3.13.

The MAC entity shall:

1> if the MAC entity receives an Aperiodic CSI trigger State Subselection MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding Aperiodic CSI trigger State Subselection MAC CE.

### 5.18.4 Activation/Deactivation of UE-specific PDSCH TCI state

The network may activate and deactivate the configured TCI states for PDSCH of a Serving Cell or a set of Serving Cells configured in *simultaneousTCI-UpdateList1* or *simultaneousTCI-UpdateList2* by sending the TCI States Activation/Deactivation for UE-specific PDSCH MAC CE described in clause 6.1.3.14. The network may activate and deactivate the configured TCI states for a codepoint of the DCI *Transmission configuration indication* field as specified in TS 38.212 [9] for PDSCH of a Serving Cell by sending the Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE described in clause 6.1.3.24. The configured TCI states for PDSCH are initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives a TCI States Activation/Deactivation for UE-specific PDSCH MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the TCI States Activation/Deactivation for UE-specific PDSCH MAC CE.

1> if the MAC entity receives an Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE.

### 5.18.5 Indication of TCI state for UE-specific PDCCH

The network may indicate a TCI state for PDCCH reception for a CORESET of a Serving Cell or a set of Serving Cells configured in *simultaneousTCI-UpdateList1* or *simultaneousTCI-UpdateList2* by sending the TCI State Indication for UE-specific PDCCH MAC CE described in clause 6.1.3.15.

The MAC entity shall:

1> if the MAC entity receives a TCI State Indication for UE-specific PDCCH MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the TCI State Indication for UE-specific PDCCH MAC CE.

### 5.18.6 Activation/Deactivation of Semi-persistent CSI reporting on PUCCH

The network may activate and deactivate the configured Semi-persistent CSI reporting on PUCCH of a Serving Cell by sending the SP CSI reporting on PUCCH Activation/Deactivation MAC CE described in clause 6.1.3.16. The configured Semi-persistent CSI reporting on PUCCH is initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives an SP CSI reporting on PUCCH Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the SP CSI reporting on PUCCH Activation/Deactivation MAC CE.

### 5.18.7 Activation/Deactivation of Semi-persistent SRS and Indication of spatial relation of SP/AP SRS

The network may activate and deactivate the configured Semi-persistent SRS resource sets of a Serving Cell by sending the SP SRS Activation/Deactivation MAC CE described in clause 6.1.3.17. The network may also activate and deactivate the configured Semi-persistent SRS resource sets of a Serving Cell by sending the Enhanced SP/AP SRS Spatial Relation Indication MAC CE described in clause 6.1.3.26. The configured Semi-persistent SRS resource sets are initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync. The network may indicate the spatial relation info of SP/AP SRS resource sets of a Serving Cell by sending the Enhanced SP/AP SRS spatial relation Indication MAC CE described in clause 6.1.3.26.

The MAC entity shall:

1> if the MAC entity receives an SP SRS Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the SP SRS Activation/Deactivation MAC CE.

1> if the MAC entity receives an Enhanced SP/AP SRS Spatial Relation Indication MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the Enhanced SP/AP SRS Spatial Relation Indication MAC CE.

### 5.18.8 Activation/Deactivation of spatial relation of PUCCH resource

The network may activate and deactivate a spatial relation for a PUCCH resource of a Serving Cell by sending the PUCCH spatial relation Activation/Deactivation MAC CE described in clause 6.1.3.18. The network may also activate and deactivate a spatial relation for a PUCCH resource or a PUCCH resource group of a Serving Cell by sending the Enhanced PUCCH spatial relation Activation/Deactivation MAC CE described in clause 6.1.3.25. The configured spatial relation for a PUCCH resource is initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives a PUCCH spatial relation Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the PUCCH spatial relation Activation/Deactivation MAC CE.

1> if the MAC entity receives an Enhanced PUCCH spatial relation Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the Enhanced PUCCH spatial relation Activation/Deactivation MAC CE.

### 5.18.9 Activation/Deactivation of semi-persistent ZP CSI-RS resource set

The network may activate and deactivate the configured Semi-persistent ZP CSI-RS resource set of a Serving Cell by sending the SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE described in clause 6.1.3.19. The configured Semi-persistent ZP CSI-RS resource sets are initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives an SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE.

### 5.18.10 Recommended Bit Rate

The recommended bit rate procedure is used to provide the MAC entity with information about the bit rate which the gNB recommends. The bit rate is the recommended bit rate of the physical layer. Averaging window of default value 2000 ms will apply as specified in TS 26.114 [13].

The gNB may transmit the Recommended bit rate MAC CE to the MAC entity to indicate the recommended bit rate for the UE for a specific logical channel and a specific direction (either uplink or downlink). Upon reception of a Recommended bit rate MAC CE the MAC entity shall:

- indicate to upper layers the recommended bit rate for the indicated logical channel and direction.

The MAC entity may request the gNB to indicate the recommended bit rate for a specific logical channel and a specific direction. If the MAC entity is requested by upper layers to query the gNB for the recommended bit rate for a logical channel and for a direction (i.e. for uplink or downlink), the MAC entity shall:

1> if a Recommended bit rate query for this logical channel and this direction has not been triggered:

2> trigger a Recommended bit rate query for this logical channel, direction, and desired bit rate.

If the MAC entity has UL resources allocated for new transmission the MAC entity shall:

1> for each Recommended bit rate query that the Recommended Bit Rate procedure determines has been triggered and not cancelled:

2> if *bitRateQueryProhibitTimer* for the logical channel and the direction of this Recommended bit rate query is configured, and it is not running; and

2> if the MAC entity has UL resources allocated for new transmission and the allocated UL resources can accommodate a Recommended bit rate MAC CE plus its subheader as a result of LCP as defined in clause 5.4.3.1:

3> instruct the Multiplexing and Assembly procedure to generate the Recommended bit rate MAC CE for the logical channel and the direction of this Recommended bit rate query;

3> start the *bitRateQueryProhibitTimer* for the logical channel and the direction of this Recommended bit rate query;

3> cancel this Recommended bit rate query.

### 5.18.11 Void

### 5.18.12 Void

### 5.18.13 Void

### 5.18.14 Update of Pathloss Reference RS of SRS

The network may activate and update a pathloss reference RS for a SRS resource of a Serving Cell by sending the SRS Pathloss Reference RS Update MAC CE described in clause 6.1.3.27.

The MAC entity shall:

1> if the MAC entity receives a SRS Pathloss Reference RS Update MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the SRS Pathloss Reference RS Update MAC CE.

### 5.18.15 Update of Pathloss Reference RS of PUSCH

The network may activate and update a pathloss reference RS for PUSCH of a Serving Cell by sending the PUSCH Pathloss Reference RS Update MAC CE described in clause 6.1.3.28.

The MAC entity shall:

1> if the MAC entity receives a PUSCH Pathloss Reference RS Update MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the PUSCH Pathloss Reference RS Update MAC CE.

### 5.18.16 Indication of spatial relation of SRS resource for a Serving Cell set

The network may indicate the spatial relation info of SRS resource of a set of Serving Cells configured in *simultaneousSpatial-UpdatedList1* or *simultaneousSpatial-UpdatedList2* by sending the Serving Cell set based SRS Spatial Relation Indication MAC CE described in clause 6.1.3.29.

The MAC entity shall:

1> if the MAC entity receives a Serving Cell set based SRS Spatial Relation Indication MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the Serving Cell set based SRS Spatial Relation Indication MAC CE.

### 5.18.17 Activation/Deactivation of Semi-persistent Positioning SRS

The network may activate and deactivate the configured resource sets of Semi-persistent Positioning SRS of a Serving Cell by sending the SP Positioning SRS Activation/Deactivation MAC CE described in clause 6.1.3.36. The configured resource sets Semi-persistent Positioning SRS are initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives an SP Positioning SRS Activation/Deactivation MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the SP Positioning SRS Activation/Deactivation MAC CE.

### 5.18.18 Timing offset adjustment for IAB

For IAB operation, in order to achieve time-domain synchronization across multiple backhaul hops, a timing adjustment may be provided to an IAB node by its parent node. This parameter is applicable only to IAB nodes. The Timing Delta MAC CE carries Tdelta which is used to determine the timing adjustment.

Upon reception of a Timing Delta MAC CE the IAB node shall:

- apply the value of Tdelta as specified in TS 38.213 [6].

### 5.18.19 Guard symbols for IAB

For IAB operation, the MAC entity on the IAB-DU or IAB-donor-DU reserves a sufficient number of symbols at the beginning and/or the end of slots where the child IAB-node switches operation from its IAB-DU to its IAB-MT function and operation from its IAB-MT to its IAB-DU function. The MAC entity on the IAB-DU or IAB-donor-DU informs the child node about the number of guard symbols it provides via the Provided Guard Symbols MAC CE. The IAB-MT on the child node may inform the parent IAB-DU or IAB-donor-DU about the number of guard symbols desired via the Desired Guard Symbols MAC CE.

Upon reception of a Provided Guard Symbols MAC CE the MAC entity shall:

- indicate to lower layers the number of provided guard symbols and the SCS configuration for the indicated Serving Cell.

The MAC entity may:

1> if a Desired Guard Symbol query has not been triggered:

2> trigger a Desired Guard Symbol query for this Serving Cell.

If the MAC entity has UL resources allocated for new transmission the MAC entity shall:

1> for each Desired Guard Symbol query that has been triggered and not cancelled:

2> if the allocated UL resources can accommodate a Desired Guard Symbols MAC CE plus its subheader as a result of LCP as defined in clause 5.4.3.1:

3> instruct the Multiplexing and Assembly procedure to generate the Desired Guard Symbols MAC CE;

3> cancel this Desired Guard Symbol query.

A separate value for the number of guard symbols is specified for each of the following eight switching scenarios (see Table 5.18.19-1).

Table 5.18.19-1: Switching scenarios and relevant guard symbols

|  |  |
| --- | --- |
| Switching scenario | Field for number of guard symbols in MAC CE |
| IAB-MT operation to IAB-DU operation | MT Rx to DU Tx | NmbGS1 |
| MT Rx to DU Rx | NmbGS2 |
| MT Tx to DU Tx | NmbGS3 |
| MT Tx to DU Rx | NmbGS4 |
| IAB-DU operation to IAB-MT operation | DU Rx to MT Tx | NmbGS5 |
| DU Rx to MT Rx | NmbGS6 |
| DU Tx to MT Tx | NmbGS7 |
| DU Tx to MT Rx | NmbGS8 |

*END OF CHANGES*