**3GPP TSG-RAN WG2 Meeting #129bis  *R2-250xxxx***

**Wuhan, China, 7 - 11 April 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.321** | **CR** | **nnnn** | **rev** | **-** | **Current version:** | **18.4.0** |  |
|  |
| *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:***  | Introduction of Rel-19 MIMO  |
|  |  |
| ***Source to WG:*** | Samsung (Rapporteur) |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_MIMO\_Ph5-Core |  | ***Date:*** | 2025-04-xx |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | Introduce the Rel-19 MIMO features based on the the following agreements. RAN2#128: * New MAC CE is introduced for PL offset update for asymmetric DL sTRP/UL mTRP. This new MAC CE is identified by new eLCID.
* Absolute value of PL offset is indicated in the new MAC CE. For the offset value, the value range is [-12, 60] dB and the step size is 4dB.
* In the MAC CE, PL offset value can be updated for any configured TCI states with RRC configured PL offset, i.e., not limited to the activated TCI states.

RAN2#129: * One PL offset value is indicated for each TCI state included in the new MAC CE.
* The new MAC CE contains one serving cell ID and one BWP ID
* TCI state ID is used to indicate a TCI state in the new MAC CE (i.e., no bitmap for TCI states is needed)
* The new MAC CE can include flexible number of PL offset values.
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|  |  |
| ***Summary of change:*** | 1. Introduce a new MAC CE for pathloss offset update |
|  |  |
| ***Consequences if not approved:*** | Rel-19 MIMO features cannot be supported. |
|  |  |
| ***Clauses affected:*** | 5.18, 6.1.3, 6.2.1 |
|  |  |
|  | **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:*** |  |

### 5.18.XX Update of Pathloss Offset

The network may update pathloss offsets configured for joint or UL TCI states of a Serving Cell by sending the Pathloss Offset Update MAC CE described in clause 6.1.3.YY.

The MAC entity shall:

1> if the MAC entity receives a Pathloss Offset Update MAC CE on a Serving Cell:

2> indicate to lower layers the information regarding the Pathloss Offset Update MAC CE.

#### 6.1.3.YY Pathloss Offset Update MAC CE

The Pathloss Offset Update MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-1b. It has a variable size with the following fields:

- Serving Cell ID: This field indicates the identity of the Serving Cell to which the MAC CE is applied. The length of this field is 5 bits;

- BWP ID: This field indicates a BWP as the codepoint of the DCI *bandwidth part indicator* field as specified in TS 38.212 [9]. If the value of *unifiedTCI-StateType* in the Serving Cell indicated by Serving Cell IDis *joint*, this field indicates a DL BWP to which the MAC CE is applied. If the value of *unifiedTCI-StateType* in the Serving Cell indicated by Serving Cell ID is *separate*, this field indicates a UL BWP to which the MAC CE is applied. The length of this field is 2 bits;

- TCI state ID: This field indicates a TCI state identified by *TCI-StateId* or *TCI-UL-State-Id* as specified in TS 38.331 [5]. The length of this field is 7 bits. If the value of *unifiedTCI-StateType* in the Serving Cell indicated by Serving Cell IDis *joint*, this field indicates a *TCI-StateId* for a joint TCI state. If the value of *unifiedTCI-StateType* in the Serving Cell indicated by Serving Cell ID is *separate*, the most significant bit of the field is considered as the reserved bit and remainder 6 bits indicate a *TCI-UL-State-Id* for a UL TCI state;

- Pathloss Offset: This field indicates the pathloss offset for the TCI state indicated by the preceding TCI state ID field. It updates the pathloss offset configured by *pathlossOffset* for the TCI state, as specified in TS 38.331 [5]. The range of the indicated pathloss offset is from -12 dB to 60 dB with a step size of 4 dB. The field value 0 corresponds to -12 dB, the field value 1 corresponds to -8 dB and so on. The field values from 19 onwards are reserved. The length of this field is 5 bits;

- R: Reserved bit, set to 0.



Figure 6.1.3.YY: Pathloss Offset Update MAC CE

## 6.2 Formats and parameters

### 6.2.1 MAC subheader for DL-SCH and UL-SCH

The MAC subheader consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE or padding as described in Tables 6.2.1-1 and 6.2.1-1c for the DL-SCH and Tables 6.2.1-2 and 6.2.1-2c for the UL-SCH. There is one LCID field per MAC subheader. The size of the LCID field is 6 bits. If the LCID field is set to 34 as in Table 6.2.1-1 or 6.2.1-2, one additional octet is present in the MAC subheader containing the eLCID field and follow the octet containing LCID field. If the LCID field is set to 33 as in Table 6.2.1-1 or 6.2.1-2, two additional octets are present in the MAC subheader containing the eLCID field and these two additional octets follow the octet containing LCID field;

NOTE 1: For MBS broadcast, a logical channel is identified based on G-RNTI and LCID if the same LCID is allocated for logical channels corresponding to different G-RNTIs.

- eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE as described in tables 6.2.1-1a, 6.2.1-1b, 6.2.1-2a and 6.2.1-2b for the DL-SCH and UL-SCH respectively. The size of the eLCID field is either 8 bits or 16 bits.

NOTE 2: The extended Logical Channel ID space using two-octet eLCID and the relevant MAC subheader format is used, only when configured, on the NR backhaul links between IAB nodes or between IAB node and IAB Donor, or for multicast MTCHs.

- L: The Length field indicates the length of the corresponding MAC SDU or variable-sized MAC CE in bytes. There is one L field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. The size of the L field is indicated by the F field;

- F: The Format field indicates the size of the Length field. There is one F field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. The size of the F field is 1 bit. The value 0 indicates 8 bits of the Length field. The value 1 indicates 16 bits of the Length field;

- LX: The LCID extension field indicates the use of extended LCID space. The size of the LX field is 1 bit. The LX field set to 1 indicates the use of Table 6.2.1-2c, otherwise R bit is present instead (i.e. set to 0);

- R: Reserved bit, set to 0.

The MAC subheader is octet aligned.

Table 6.2.1-1: Values of LCID for DL-SCH

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | CCCH |
| 1–32 | Identity of the logical channel of DCCH, DTCH and multicast MTCH |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one-octet eLCID field) |
| 35–46 | Reserved |
| 47 | Recommended bit rate |
| 48 | SP ZP CSI-RS Resource Set Activation/Deactivation |
| 49 | PUCCH spatial relation Activation/Deactivation |
| 50 | SP SRS Activation/Deactivation  |
| 51 | SP CSI reporting on PUCCH Activation/Deactivation |
| 52 | TCI State Indication for UE-specific PDCCH |
| 53 | TCI States Activation/Deactivation for UE-specific PDSCH |
| 54 | Aperiodic CSI Trigger State Subselection |
| 55 | SP CSI-RS/CSI-IM Resource Set Activation/Deactivation |
| 56 | Duplication Activation/Deactivation |
| 57 | SCell Activation/Deactivation (four octets) |
| 58 | SCell Activation/Deactivation (one octet) |
| 59 | Long DRX Command |
| 60 | DRX Command |
| 61 | Timing Advance Command |
| 62 | UE Contention Resolution Identity |
| 63 | Padding |

Table 6.2.1-1a: Values of two-octet eLCID for DL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to (216 – 1) | 320 to (216 + 319) | Identity of the logical channel |

Table 6.2.1-1b: Values of one-octet eLCID for DL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 214 | 64 to 278 | Reserved |
| 215 | 279 | Pathloss Offset Update |
| 216 | 280 | Aggregated SP Positioning SRS Activation/Deactivation |
| 217 | 281 | Enhanced SP CSI reporting on PUCCH Activation/Deactivation |
| 218 | 282 | Cross-RRH TCI State Indication for UE-specific PDCCH |
| 219 | 283 | LTM Cell Switch Command |
| 220 | 284 | Candidate Cell TCI States Activation/Deactivation |
| 221 | 285 | PSI-Based SDU Discard Activation/Deactivation |
| 222 | 286 | Enhanced Unified TCI states Activation/Deactivation MAC CE for Joint TCI States |
| 223 | 287 | Enhanced Unified TCI states Activation/Deactivation MAC CE for Separate TCI States |
| 224 | 288 | NCR Access Link Beam Indication |
| 225 | 289 | NCR Downlink Backhaul Link Beam Indication |
| 226 | 290 | NCR Uplink Backhaul Link Beam Indication |
| 227 | 291 | Serving Cell Set based SRS TCI State Indication |
| 228 | 292 | SP/AP SRS TCI State Indication |
| 229 | 293 | BFD-RS Indication |
| 230 | 294 | Differential Koffset |
| 231 | 295 | Enhanced SCell Activation/Deactivation (one octet Ci field) |
| 232 | 296 | Enhanced SCell Activation/Deactivation (four octet Ci field) |
| 233 | 297 | Unified TCI States Activation/Deactivation |
| 234 | 298 | PUCCH Power Control Set Update for multiple TRP PUCCH repetition |
| 235 | 299 | PUCCH spatial relation Activation/Deactivation for multiple TRP PUCCH repetition |
| 236 | 300 | Enhanced TCI States Indication for UE-specific PDCCH |
| 237 | 301 | Positioning Measurement Gap Activation/Deactivation Command |
| 238 | 302 | PPW Activation/Deactivation Command |
| 239 | 303 | DL Tx Power Adjustment |
| 240 | 304 | Timing Case Indication |
| 241 | 305 | Child IAB-DU Restricted Beam Indication |
| 242 | 306 | Case-7 Timing advance offset |
| 243 | 307 | Provided Guard Symbols for Case-6 timing |
| 244 | 308 | Provided Guard Symbols for Case-7 timing |
| 245 | 309 | Serving Cell Set based SRS Spatial Relation Indication |
| 246 | 310 | PUSCH Pathloss Reference RS Update |
| 247 | 311 | SRS Pathloss Reference RS Update |
| 248 | 312 | Enhanced SP/AP SRS Spatial Relation Indication |
| 249 | 313 | Enhanced PUCCH Spatial Relation Activation/Deactivation |
| 250 | 314 | Enhanced TCI States Activation/Deactivation for UE-specific PDSCH |
| 251 | 315 | Duplication RLC Activation/Deactivation |
| 252 | 316 | Absolute Timing Advance Command |
| 253 | 317 | SP Positioning SRS Activation/Deactivation |
| 254 | 318 | Provided Guard Symbols |
| 255 | 319 | Timing Delta |

Table 6.2.1-1c: Values of LCID for MBS multicast MCCH and MBS broadcast on DL-SCH

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | Broadcast MCCH or multicast MCCH |
| 1–32 | Identity of the logical channel of broadcast MTCH |
| 33–63 | Reserved |

Table 6.2.1-2: Values of LCID for UL-SCH when the LX field is not present or is set to 0

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | CCCH of size 64 bits, except for an (e)RedCap UE |
| 1–32 | Identity of the logical channel of DCCH and DTCH |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one-octet eLCID field) |
| 35 | CCCH of size 48 bits for a RedCap UE  |
| 36 | CCCH of size 64 bits for a RedCap UE |
| 37–42 | Reserved |
| 43 | Truncated Enhanced BFR (one octet Ci) |
| 44 | Timing Advance Report |
| 45 | Truncated Sidelink BSR |
| 46 | Sidelink BSR |
| 47 | Reserved |
| 48 | LBT failure (four octets) |
| 49 | LBT failure (one octet) |
| 50 | BFR (one octet Ci) |
| 51 | Truncated BFR (one octet Ci) |
| 52 | CCCH of size 48 bits, except for an (e)RedCap UE |
| 53 | Recommended bit rate query |
| 54 | Multiple Entry PHR (four octets Ci) |
| 55 | Configured Grant Confirmation |
| 56 | Multiple Entry PHR (one octet Ci) |
| 57 | Single Entry PHR |
| 58 | C-RNTI |
| 59 | Short Truncated BSR |
| 60 | Long Truncated BSR |
| 61 | Short BSR |
| 62 | Long BSR |
| 63 | Padding |
| NOTE: CCCH of size 48 bits and CCCH of size 64 bits are referred to as CCCH and CCCH1, respectively, in TS 38.331 [5]. |

Table 6.2.1-2a: Values of two-octet eLCID for UL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to (216 – 1) | 320 to (216 + 319) | Identity of the logical channel |

Table 6.2.1-2b: Values of one-octet eLCID for UL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 218 | 64 to 282 | Reserved |
| 219 | 283 | Enhanced Multiple Entry PHR for multiple TRP STx2P (four octets Ci) |
| 220 | 284 | Enhanced Multiple Entry PHR for multiple TRP STx2P (one octets Ci) |
| 221 | 285 | Enhanced Single Entry PHR for multiple TRP STx2P |
| 222 | 286 | SL LBT Failure |
| 223 | 287 | Multiple Entry PHR with assumed PUSCH (four octets Ci) |
| 224 | 288 | Multiple Entry PHR with assumed PUSCH (one octets Ci) |
| 225 | 289 | Single Entry PHR with assumed PUSCH |
| 226 | 290 | SL-PRS Resource Request |
| 227 | 291 | Refined Long BSR |
| 228 | 292 | Delay Status Report |
| 229 | 293 | Enhanced Multiple Entry PHR for multiple TRP (four octets Ci) |
| 230 | 294 | Enhanced Multiple Entry PHR for multiple TRP (one octets Ci) |
| 231 | 295 | Enhanced Single Entry PHR for multiple TRP |
| 232 | 296 | Enhanced Multiple Entry PHR (four octets Ci) |
| 233 | 297 | Enhanced Multiple Entry PHR (one octets Ci) |
| 234 | 298 | Enhanced Single Entry PHR |
| 235 | 299 | Enhanced BFR (one octet Ci) |
| 236 | 300 | Enhanced BFR (four octet Ci) |
| 237 | 301 | Truncated Enhanced BFR (four octet Ci) |
| 238 | 302 | Positioning Measurement Gap Activation/Deactivation Request |
| 239 | 303 | IAB-MT Recommended Beam Indication |
| 240 | 304 | Desired IAB-MT PSD range |
| 241 | 305 | Desired DL Tx Power Adjustment |
| 242 | 306 | Case-6 Timing Request |
| 243 | 307 | Desired Guard Symbols for Case 6 timing |
| 244 | 308 | Desired Guard Symbols for Case 7 timing |
| 245 | 309 | Extended Short Truncated BSR |
| 246 | 310 | Extended Long Truncated BSR |
| 247 | 311 | Extended Short BSR |
| 248 | 312 | Extended Long BSR |
| 249 | 313 | Extended Pre-emptive BSR |
| 250 | 314 | BFR (four octets Ci) |
| 251 | 315 | Truncated BFR (four octets Ci) |
| 252 | 316 | Multiple Entry Configured Grant Confirmation |
| 253 | 317 | Sidelink Configured Grant Confirmation |
| 254 | 318 | Desired Guard Symbols |
| 255 | 319 | Pre-emptive BSR |

Table 6.2.1-2c: Values of LCID for UL-SCH when the LX field is set to 1

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 | (216 + 320) | CCCH of size 48 bits for an eRedCap UE  |
| 1 | (216 + 321) | CCCH of size 64 bits for an eRedCap UE |
| 2 | (216 + 322) | CCCH of size 48 bits for PUCCH repetition of Msg4 HARQ-ACK, except for an (e)RedCap UE |
| 3 | (216 + 323) | CCCH of size 64 bits for PUCCH repetition of Msg4 HARQ-ACK, except for an (e)RedCap UE |
| 4 | (216 + 324) | CCCH of size 48 bits for PUCCH repetition of Msg4 HARQ-ACK of a RedCap UE |
| 5 | (216 + 325) | CCCH of size 64 bits for PUCCH repetition of Msg4 HARQ-ACK of a RedCap UE |
| 6 | (216 + 326) | CCCH of size 48 bits for PUCCH repetition of Msg4 HARQ-ACK of an eRedCap UE |
| 7 | (216 + 327) | CCCH of size 64 bits for PUCCH repetition of Msg4 HARQ-ACK of an eRedCap UE |
| 8 to 63 | (216 + 328) to (216 + 383) | Reserved |
| NOTE 1: The MAC entity may use the code point corresponding to a given feature or feature combination in Table 6.2.1-2c only if network indicates support for the corresponding feature or feature combination.NOTE 2: CCCH of size 48 bits and CCCH of size 64 bits are referred to as CCCH and CCCH1, respectively, in TS 38.331 [5].NOTE 3: For UE capable of PUCCH repetition of Msg4 HARQ-ACK, the MAC entity uses the code points corresponding to PUCCH repetition of Msg4 HARQ-ACK if *numberOfMsg4HARQ-ACK-Repetitions* is configured and *rsrp-ThresholdMsg4HARQ-ACK* is not configured, or if both are configured and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg4HARQ-ACK.* |