**3GPP TSG-RAN2 Meeting #110-e *R2-2006172***

**Electronic, 01 – 12 Jun 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.321** | **CR** | 0758 | **rev** | **-** | **Current version:** | **16.0.0** |  |
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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:*** | Running CR for MAC in R16 positioning | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | RAN2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2020-06-01 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Some editorial changes are included, which include:  - Change to the name of the field name nr-DL-PRS-Resource ID to nr-DL-PRS-ResourceId according to the latest LPP spec.  - Previously, the definition of the field DL-PRS ID is given as the identity of the DL-PRS resource. However, according to the LPP spec, this field is more like an identity associated with a TRP.  - For the field description of the field C, there is a double condition for A/D and C. In order to provide the definition with clarify, the condition for “Otherwise” can be clarified.  Update during RAN2#109bis-e  - Remove the change to DL PRS id to wait for the conclusions for TRP-ID discussion.  - The LCID/eLCID of SP positioning SRS activation/deactivation MAC CE should be above 64, i.e., set2  The CR for the R16 positioning is updated based on the following agreemetns in RAN2#110-e:  Agreements:  SP positioning SRS activation/deactivation MAC CE includes UL carrier indication, i.e., no change to the current spec.  SP positioning SRS activation/deactivation MAC CE should optionally contain indication of spatial relations.  SP positioning SRS activation/deactivation MAC CE should optionally contain indication of DL PRS resource ID  SP positioning SRS activation/deactivation MAC CE should optionally contain indication of SSB index  PHR should not be triggered when pathloss reference for positioning SRS has changed more than phr-TxPowerFactorChange  TP from R2-2005905 is endorsed as a baseline,  The CRis proposed based on this | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1/ addition of fields S, PI, SI to indicate the presence of Spatial Relations for resource i, presence of DL-PRS resource id and SSB index, respectively.  2/ Update the figure for the MAC CE accordingly  3/ Clarify that PHR should not be triggered when pathloss reference for positioning SRS has changed more than phr-TxPowerFactorChange | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

============================FIRST CHANGE============================================

5.4.6 Power Headroom Reporting

The Power Headroom reporting procedure is used to provide the serving gNB with the following information:

- Type 1 power headroom: the difference between the nominal UE maximum transmit power and the estimated power for UL-SCH transmission per activated Serving Cell;

- Type 2 power headroom: the difference between the nominal UE maximum transmit power and the estimated power for UL-SCH and PUCCH transmission on SpCell of the other MAC entity (i.e. E-UTRA MAC entity in EN-DC, NE-DC, and NGEN-DC cases);

- Type 3 power headroom: the difference between the nominal UE maximum transmit power and the estimated power for SRS transmission per activated Serving Cell.

RRC controls Power Headroom reporting by configuring the following parameters:

- *phr-PeriodicTimer*;

- *phr-ProhibitTimer*;

- *phr-Tx-PowerFactorChange*;

- *phr-Type2OtherCell*;

- *phr-ModeOtherCG*;

- *multiplePHR*.

A Power Headroom Report (PHR) shall be triggered if any of the following events occur:

- *phr-ProhibitTimer* expires or has expired and the path loss has changed more than *phr-Tx-PowerFactorChange* dB for at least one activated Serving Cell of any MAC entity which is used as a pathloss reference since the last transmission of a PHR in this MAC entity when the MAC entity has UL resources for new transmission;

NOTE 1: The path loss variation for one cell assessed above is between the pathloss measured at present time on the current pathloss reference and the pathloss measured at the transmission time of the last transmission of PHR on the pathloss reference in use at that time, irrespective of whether the pathloss reference has changed in between. The current pathloss reference for this purpose does not include any pathloss reference configured using *pathlossReferenceRS-Pos* in TS 38.331 [5].

- *phr-PeriodicTimer* expires;

- upon configuration or reconfiguration of the power headroom reporting functionality by upper layers, which is not used to disable the function;

- activation of an SCell of any MAC entity with configured uplink;

- addition of the PSCell (i.e. PSCell is newly added or changed);

- *phr-ProhibitTimer* expires or has expired, when the MAC entity has UL resources for new transmission, and the following is true for any of the activated Serving Cells of any MAC entity with configured uplink:

- there are UL resources allocated for transmission or there is a PUCCH transmission on this cell, and the required power backoff due to power management (as allowed by P-MPRc as specified in TS 38.101-1 [14], TS 38.101-2 [15], and TS 38.101-3 [16]) for this cell has changed more than *phr-Tx-PowerFactorChange* dB since the last transmission of a PHR when the MAC entity had UL resources allocated for transmission or PUCCH transmission on this cell.

NOTE 2: The MAC entity should avoid triggering a PHR when the required power backoff due to power management decreases only temporarily (e.g. for up to a few tens of milliseconds) and it should avoid reflecting such temporary decrease in the values of PCMAX,f,c/PH when a PHR is triggered by other triggering conditions.

NOTE 3: If a HARQ process is configured with *cg-RetransmissionTimer* and if the PHR is already included in a MAC PDU for transmission by this HARQ process, but not yet transmitted by lower layers, it is up to UE implementation how to handle the PHR content.

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

1> if it is the first UL resource allocated for a new transmission since the last MAC reset:

2> start *phr-PeriodicTimer*;

1> if the Power Headroom reporting procedure determines that at least one PHR has been triggered and not cancelled; and

1> if the allocated UL resources can accommodate the MAC CE for PHR which the MAC entity is configured to transmit, plus its subheader, as a result of LCP as defined in clause 5.4.3.1:

2> if *multiplePHR* with value *true* is configured:

3> for each activated Serving Cell with configured uplink associated with any MAC entity:

4> obtain the value of the Type 1 or Type 3 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6];

4> if this MAC entity has UL resources allocated for transmission on this Serving Cell; or

4> if the other MAC entity, if configured, has UL resources allocated for transmission on this Serving Cell and *phr-ModeOtherCG* is set to *real* by upper layers:

5> obtain the value for the corresponding PCMAX,f,c field from the physical layer.

3> if *phr-Type2OtherCell* with value *true* is configured:

4> if the other MAC entity is E-UTRA MAC entity:

5> obtain the value of the Type 2 power headroom for the SpCell of the other MAC entity (i.e. E-UTRA MAC entity);

5> if *phr-ModeOtherCG* is set to *real* by upper layers:

6> obtain the value for the corresponding PCMAX,f,c field for the SpCell of the other MAC entity (i.e. E-UTRA MAC entity) from the physical layer.

3> instruct the Multiplexing and Assembly procedure to generate and transmit the Multiple Entry PHR MAC CE as defined in clause 6.1.3.9 based on the values reported by the physical layer.

2> else (i.e. Single Entry PHR format is used):

3> obtain the value of the Type 1 power headroom from the physical layer for the corresponding uplink carrier of the PCell;

3> obtain the value for the corresponding PCMAX,f,c field from the physical layer;

3> instruct the Multiplexing and Assembly procedure to generate and transmit the Single Entry PHR MAC CE as defined in clause 6.1.3.8 based on the values reported by the physical layer.

2> start or restart *phr-PeriodicTimer*;

2> start or restart *phr-ProhibitTimer*;

2> cancel all triggered PHR(s).

==========================SECOND CHANGE============================================

6.1.3.36 SP Positioning SRS Activation/Deactivation MAC CE

The SP Positioning SRS Activation/Deactivation MAC CE is identified by a MAC subheader with LCID and eLCID as specified in Table 6.2.1-1. It has a variable size with following fields:

- A/D: This field indicates whether to activate or deactivate indicated SP Positioning SRS resource set. The field is set to 1 to indicate activation, otherwise it indicates deactivation;

- Positioning SRS Resource Set's Cell ID: This field indicates the identity of the Serving Cell, which contains activated/deactivated SP Positioning SRS Resource Set. If the C field is set to 0, this field also indicates the identity of the Serving Cell which contains all resources indicated by the Spatial Relation for Resource IDi fields, if present. The length of the field is 5 bits;

- Positioning SRS Resource Set's BWP ID: This field indicates a UL BWP as the codepoint of the DCI *bandwidth part indicator* field as specified in TS 38.212 [9], which contains activated/deactivated SP Positioning SRS Resource Set. If the C field is set to 0, this field also indicates the identity of the BWP which contains all resources indicated by the Spatial Relation for Resource IDi fields, if present. The length of the field is 2 bits;

- C: This field indicates whether the octets containing Resource Serving Cell ID field(s) and Resource BWP ID field(s) withn the field Spatial Relation for Resource ID i are present, except for Spatial Relation Resource IDi with DL-PRS or SSB. When A/D is set to 1, if this field is set to 1, the octets containing Resource Serving Cell ID field(s) and Resource BWP ID field(s) in the field Spatial Relation for Resource IDi are present, otherwise if this field is set to 0, they are not present. When A/D is set to 0, this field is always set to 0 that they are not present;

- SUL: This field indicates whether the MAC CE applies to the NUL carrier or SUL carrier configuration. This field is set to 1 to indicate that it applies to the SUL carrier configuration, and it is set to 0 to indicate that it applies to the NUL carrier configuration;

- Positoining SRS Resource Set ID: This field indicates the SP Positioning SRS Resource Set identified by *SRS-PosResourceSetId* as specified in TS 38.331 [5], which is to be activated or deactivated. The length of the field is 4 bits;

- Spatial Relation for Resource IDi: The field Spatial Relation for Resource IDi is only present if MAC CE is used for activation, i.e. the A/D field is set to 1. M is the total number of Positioning SRS resource(s) configured under the SP Positioning SRS resource set indicated by the field Positioning SRS Resource Set ID. There are 4 types of Spatial Relation for Resource IDi, which is indicated by the F (F0 and F1) field within. The fields within Spatial Relation for Resource IDi are shown in Figures 6.1.3.36-2 to 6.1.3.36-5 for the 4 types of Spatial Relations for Resource IDi;

- S: This field indicates whether the fields Spatial Relation for Resource IDi for the positioning SRS resource i within the positioning SRS resource set are present. If the field is set to 1, the fields Spatial Relation for Resource IDi are present; otherwise, they are absent;

- R: Reserved bit, set to 0.

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**Figure 6.1.3.36-1: SP Positioning SRS Activation/Deactivation MAC CE**

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**Figure 6.1.3.36-2: Spatial Relation for Resource IDi with NZP CSI-RS**

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**Figure 6.1.3.36-3: Spatial Relation for Resource IDi with SSB**

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**Figure 6.1.3.36-4: Spatial Relation for Resource IDi with SRS**

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**Figure 6.1.3.36-5: Spatial Relation for Resource IDi with DL-PRS**

The field Spatial Relation for Resource IDi consists of the following fields:

- F0: This field indicates the type of a resource used as a spatial relation for the ith Positioning SRS resource within the Positioning SRS Resource Set indicated with the field Positioning SRS Resource Set ID. The field is set to 00 to indicate NZP CSI-RS resource index is used; it is set to 01 to indicate SSB index is used; it is set to 10 to indicate SRS resource index is used; it is set to 11 to indicate DL-PRS index is used. The length of the field is 2 bits;

- F1: This field indicates the type of SRS resource used as spatial relation for the ith Positioning SRS resource within the SP Positioning SRS Resource Set indicated with the field Positioning SRS Resource Set ID when F0 is set to 10. The field is set to 0 to indicate SRS resource index *SRS-ResourceId* as defined in TS 38.331 [5] is used; the field is set to 1 to indicate Positioning SRS resource index *SRS-PosResourceId* as defined in TS 38.331 [5] is used;

- NZP CSI-RS Resource ID: This field contains an index of *NZP-CSI-RS-ResourceID*, as specified in TS 38.331 [5], indicating the NZP CSI-RS resource, which is used to derive the spatial relation for the positioning SRS. The length of the field is 8 bits;

- SSB index: This field contains an index of SSB *SSB-Index* as specified in TS 38.331 [5] and/or TS 37.355 [23]. The length of the field is 6 bits;

- PCI: This field contains physical cell identity *PhysCellId* as specified in TS 38.331 [5] and/or TS 37.355 [23]. The length of the field is 10 bits;

- SRS resource ID: When F1 is set to 0, the field indicates an index for SRS resource *SRS-ResourceId* as defined in TS 38.331 [5]; When F1 is set to 1, the field indicates an index for Positioning SRS resource *SRS-PosResourceId* as defined in TS 38.331 [5]. The length of the field is 5 bits;

- DL-PRS Resource Set ID: This field contains an index for DL-PRS Resource Set *nr-DL-PRS-ResourceSetId* as defined in TS 37.355 [23]. The length of the field is 3 bits;

- DL-PRS Resource ID: This field contains an index for DL-PRS resource *nr-DL-PRS-Resource-Id* as defined in TS 37.355 [23]. The length of the field is 6 bits;

- DL-PRS ID: This field contains an identity for DL-PRS resource *dl-PRS-ID* as defined in TS 37.355 [23]. The length of the field is 8 bits;

- PI: This field indicates whether the field DL-PRS ID is present within the Spatial Relation for Resource IDi with DL-PRS. If the field is set to 1, the field DL-PRS ID is present; otherwise, the field is absent and the corresponding bits are considered as reserved;

- SI: This field indicates whether the field SSB index is present within the Spatial Relation for Resource IDi with SSB. If the field is set to 1, the field SSB index is present; otherwise, the field is absent and the corresponding bits are considered as reserved;

- Resource Serving Cell IDi: This field indicates the identity of the Serving Cell on which the resource used for spatial relationship derivation for the ith Positioning SRS resource is located. The length of the field is 5 bits;

- Resource BWP IDi: This field indicates a UL BWP as the codepoint of the DCI *bandwidth part indicator* field as specified in TS 38.212 [9], on which the resource used for spatial relationship derivation for the ith Positioning SRS resource is located. The length of the field is 2 bits.

=============================THIRD CHANGE=========================================

## 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 6.2.1-2 for the DL-SCH and UL-SCH respectively. There is one LCID field per MAC subheader. The LCID field size is 6 bits. If the LCID field is set to 34, 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, two additional octets are present in the MAC subheader containing the eLCID field and these two additional octets follow the octet containing LCID field;

- eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU 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 1: 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.

- 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;

- 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 |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one–octet eLCID field) |
| 35 | Reserved |
| 36 | Reserved |
| 37 | Duplication RLC Activation/Deactivation |
| 38 | Absolute Timing Advance Command |
| 39 | CC list-based SRS Activation/Deactivation |
| 40 | PUSCH Pathloss Reference RS Activation/Deactivation |
| 41 | SRS Pathloss Reference RS Activation/Deactivation |
| 42 | AP SRS spatial relation Indication |
| 43 | Enhanced PUCCH spatial relation Activation/Deactivation |
| 44 | Enhanced TCI States Activation/Deactivation for UE-specific PDSCH |
| 45 | Number of Provided Guard Symbols |
| 46 | Timing Delta |
| 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

|  |  |
| --- | --- |
| Index | LCID values |
| 320 to (216 + 191) | Identity of the logical channel |
| (216 + 192) to (216 + 319) | Reserved |

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

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| x to 255 | 64+x to 319 | reserved |
| x | 64+x | SP Positioning SRS Activation/Deactivation |

Table 6.2.1-2 Values of LCID for UL-SCH

|  |  |
| --- | --- |
| Index | LCID values |
| 0 | CCCH of size 64 bits (referred to as "CCCH1" in TS 38.331 [5]) |
| 1–32 | Identity of the logical channel |
| 33 | Extended logical channel ID field (two–octet eLCID field) |
| 34 | Extended logical channel ID field (one–octet eLCID field) |
| 35–39 | Reserved |
| 40 | Sidelink Configured Grant Confirmation |
| 41 | Truncated Sidelink BSR |
| 42 | Sidelink BSR |
| 43 | Multiple Entry Configured Grant Confirmation |
| 44 | LBT failure (four octets) |
| 45 | LBT failure (one octet) |
| 46 | SCell BFR (four octets Ci) |
| 47 | SCell BFR (one octet Ci) |
| 48 | Truncated SCell BFR (four octets Ci) |
| 49 | Truncated SCell BFR (one octet Ci) |
| 50 | Number of Desired Guard Symbols |
| 51 | Pre-emptive BSR |
| 52 | CCCH of size 48 bits (referred to as "CCCH" in TS 38.331 [5]) |
| 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 |

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

|  |  |
| --- | --- |
| Codepoint/IIndex | LCID values |
| 320 to (216 + 191) | Identity of the logical channel |
| (216 + 192) to (216 + 319) | Reserved |

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

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 255 | 64 to 319 | reserved |

NOTE 2: For the eLCID space, the 16-bit codepoint 000…00 (all zeros) corresponds to the index value of 320, while the 16-bit codepoint 111…11 (all ones) corresponds to the index value of 216+ 319.

===========================END OF CHANGES===========================================