3GPP TSG-RAN WG2 #131 draft R2-2506345

**Bengaluru, India, 25-29 August 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.321** | **CR** | **1593** | **rev** | **1** | **Current version:** | **18.4.0** |  |
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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:*** | Introduction of LTE-based 5G Broadcast Phase 2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_terr\_bcast\_Ph2-Core | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***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 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | New mechanisms for time-interleaved MCH have been introduced to enhance LTE-based 5G Broadcast in Rel-19. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Reflecting the enhancements for the time-interleaved MCH in accordance with the latest RAN1 and RAN2 agreements, namely:   1. MAC architecture is updated to reflect applicability of HARQ and non-applicability of de-multiplexing to MTCH correspondng to time-interleaved MCH. 2. Time-interleaved MCH reception is described reflecting the enhancements for scheduling and HARQ handling. 3. Enhancements to MSI and extended MSI signalling for supporting time-interleaved MCH | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Enhancements for LTE-based 5G Broadcast would not be supported in MAC specification | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.2.1; 5.12; 6.1.3.7; 6.1.3.7a | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 36.211 CR 0576  TS 36.212 CR 0376  TS 36.213 CR 1448  TS 36.300 CR 1428  TS 36.306 CR 1920  TS 38.331 CR 5143 | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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#### ------------------------------------------- [Start of the 1st change] --------------------------------------------

## 4.2 MAC architecture

The description in this clause is a model and does not specify or restrict implementations.

RRC is in control of configuration of MAC.

### 4.2.1 MAC Entities

E-UTRA defines two MAC entities; one in the UE and one in the E-UTRAN. These MAC entities handle the following transport channels:

- Broadcast Channel (BCH);

- Downlink Shared Channel(s) (DL-SCH);

- Paging Channel (PCH);

- Uplink Shared Channel(s) (UL-SCH);

- Random Access Channel(s) (RACH);

- Multicast Channel(s) (MCH);

- Sidelink Broadcast Channel (SL-BCH);

- Sidelink Discovery Channel (SL-DCH);

- Sidelink Shared Channel (SL-SCH).

The exact functions performed by the MAC entities are different in the UE from those performed in the E-UTRAN.

The RN includes both types of MAC entities; one type for communication with UEs and one type for communication with the E-UTRAN.

In Dual Connectivity, two MAC entities are configured in the UE: one for the MCG and one for the SCG. In DAPS handover, two MAC entities are configured in the UE: one MAC entity for the source cell (source MAC entity) and one MAC entity for the target cell (target MAC entity). Each MAC entity is configured by RRC with a serving cell supporting PUCCH transmission and contention based Random Access. In this specification, the term SpCell refers to such cell, whereas the term SCell refers to other serving cells. The term SpCell either refers to the PCell of the MCG or the PSCell of the SCG depending on if the MAC entity is associated to the MCG or the SCG, respectively. A Timing Advance Group containing the SpCell of a MAC entity is referred to as pTAG, whereas the term sTAG refers to other TAGs.

The functions of the different MAC entities in the UE operate independently if not otherwise indicated. The timers and paramenters used in each MAC entity are configured independently if not otherwise indicated. The Serving Cells, C-RNTI, radio bearers, logical channels, upper and lower layer entities, LCGs, and HARQ entities considered by each MAC entity refer to those mapped to that MAC entity if not otherwise indicated.

If the MAC entity is configured with one or more SCells, there are multiple DL-SCH and there may be multiple UL-SCH and RACH per MAC entity; one DL-SCH, one UL-SCH, and one RACH on the SpCell, one DL-SCH, zero or one UL-SCH and zero or one RACH for each SCell.

The physical layer may perform a listen-before-talk procedure, according to which transmissions are not performed if the channel is identified as being occupied or the physical layer may monitor for PUSCH trigger, as specified in TS 36.213 [2], according to which transmissions are not performed if PUSCH trigger B is not received. In both cases a MAC entity considers the transmission to have been performed anyway, unless stated otherwise.

Figure 4.2.1-1 illustrates one possible structure for the UE side MAC entity when SCG is not configured and for each MAC entity during DAPS handover, and it should not restrict implementation. De-Multiplexing is not applicable to MTCH corresponding to time-interleaved MCH.



Figure 4.2.1-1: MAC structure overview, UE side

Figure 4.2.1-2 illustrates one possible structure for the UE side MAC entities when MCG and SCG are configured, and it should not restrict implementation. MBMS reception and SC-PTM reception are excluded from this figure for simplicity.



Figure 4.2.1-2: MAC structure overview with two MAC entities, UE side

Figure 4.2.1-3 illustrates one possible structure for the UE side MAC entity when sidelink is configured, and it should not restrict implementation.



Figure 4.2.1-3: MAC structure overview for sidelink, UE side

#### ------------------------------------------- [End of the 1st change] --------------------------------------------

#### ------------------------------------------- [Start of the 2nd change] --------------------------------------------

## 5.12 MCH reception

Non time-interleaved MCH transmission may occur in subframes configured by upper layer for MCCH or MTCH transmission. For each such subframe, upper layer indicates if *signallingMCS* or *dataMCS* applies. The transmission of an MCH occurs in a set of subframes defined by *PMCH-Config*. An MCH Scheduling Information MAC control element is included in the first subframe allocated to the MCH within the MCH scheduling period to indicate the position of each MTCH and unused subframes on the MCH. If *pmch-InfoListExt* is configured for an MCH, an Extended MCH Scheduling Information MAC control element is included in the first subframe allocated to the corresponding MCH within the MCH scheduling period to indicate the position of each MTCH and unused subframes on the MCH, and to indicate whether MTCH transmission is to be suspended. The MAC entity shall assume that the first scheduled MTCH starts immediately after the MCCH or the MCH Scheduling Information MAC control element or the Extended MCH Scheduling Information MAC control element if the MCCH is not present, and the other scheduled MTCH(s) start immediately after the previous MTCH, at the earliest in the subframe where the previous MTCH stops. When the MAC entity needs to receive MCH, the MAC entity shall:

- attempt to decode the TB on the MCH;

- if a TB on the MCH has been successfully decoded:

- demultiplex the MAC PDU and deliver the MAC SDU(s) to upper layers.

Time-interleaved MCH transmission may occur in subframes configured by upper layer for MTCH transmission. For each such subframe, *dataMCS* applies. The transmission of an MCH occurs in a set of subframes defined by *PMCH-Config*. An MCH Scheduling Information MAC control element is included in the first subframe allocated to the MCH within the MCH scheduling period to indicate the position of each MTCH and unused subframes on the MCH. The MAC entity shall assume that the first scheduled MTCH starts at the earliest in the next subframe after the subframe containing the MCCH and/or the MCH Scheduling Information MAC control element or the Extended MCH Scheduling Information MAC control element, and the other scheduled MTCH(s) start immediately after the previous MTCH, at the earliest in the next subframe (which is not containing MCCH) after the subframe where the previous MTCH stops. Unused part of the subframe(s), if any, is filled with padding. When the MAC entity needs to receive MCH, the MAC entity shall:

- if the HARQ process is associated with a transmission indicated with a M-RNTI for time-interleaved MCH:

- if this is the first received transmission for the TB according to the MTCH schedule indicated by MSI:

- attempt to decode the received data.

- else:

- if the data for this TB has not yet been successfully decoded:

- combine the received data with the data currently in the soft buffer for this TB and attempt to decode the combined data.

- if the data which the MAC entity attempted to decode was successfully decoded for this TB; or

- if the data for this TB was successfully decoded before:

- deliver the MAC SDU(s) to upper layers.

- else:

- replace the data in the soft buffer for this TB with the data which the MAC entity attempted to decode.

- do not indicate the positive or negative acknowledgement to the physical layer.

When the MAC entity receives the Extended MCH Scheduling Information MAC control element, the MAC entity shall indicate the MTCH(s) to be suspended to the upper layers.

NOTE: The MAC entity should continue receiving MCH until the MTCH is removed from the MCCH.

#### ------------------------------------------- [End of the 2nd change] --------------------------------------------

#### ------------------------------------------- [Start of the 3rd change] --------------------------------------------

#### 6.1.3.7 MCH Scheduling Information MAC Control Element

The MCH Scheduling Information MAC Control Element illustrated in Figure 6.1.3.7-1 is identified by a MAC PDU subheader with LCID as specified in Table 6.2.1-4. This control element has a variable size. For each MTCH the fields below are included:

- LCID: this field indicates the Logical Channel ID of the MTCH. The length of the field is 5 bits;

- Stop MTCH: this field indicates the ordinal number of the subframe within the MCH scheduling period, counting only the subframes allocated to the MCH (excluding subframes containing MSI MAC CE or Extended MSI MAC CE or MCCH for time-interleaved MCH), where the corresponding MTCH stops. Value 0 corresponds to the first subframe. The length of the field is 11 bits. The special Stop MTCH value 2047 indicates that the corresponding MTCH is not scheduled. The value range 2043 to 2046 is reserved. For time-interleaved MCH, the number of subframes used for time-interleaving between Stop MTCH X and Stop MTCH X+1 are expected to be integer multiple of corresponding MCH time-interleaving configuration parameters for MTCH X+1, as specified in TS 36.331 [8].



Figure 6.1.3.7-1: MCH Scheduling Information MAC control element

#### 6.1.3.7a Extended MCH Scheduling Information MAC Control Element

The Extended MCH Scheduling Information MAC control element illustrated in Figure 6.1.3.7-2 is identified by a MAC PDU subheader with LCID as specified in Table 6.2.1-4. This control element has a variable size.

For each MTCH the fields below are included:

- LCID: this field indicates the Logical Channel ID of the MTCH. The length of the field is 5 bits;

- Stop MTCH: this field indicates the ordinal number of the subframe within the MCH scheduling period, counting only the subframes allocated to the MCH (excluding subframes containing MSI MAC CE or Extended MSI MAC CE or MCCH for time-interleaved MCH), where the corresponding MTCH stops. Value 0 corresponds to the first subframe. The length of the field is 11 bits. The special Stop MTCH value 2047 indicates that the corresponding MTCH is not scheduled. The value range 2043 to 2046 is reserved. For time-interleaved MCH, the number of subframes used for time-interleaving between Stop MTCH X and Stop MTCH X+1 are expected to be integer multiple of corresponding MCH time-interleaving configuration parameters for MTCH X+1, as specified in TS 36.331 [8].

For each MTCH the fields below may be included:

- LCID: this field indicates the Logical Channel ID of the MTCH. The length of the field is 5 bits. LCIDs x…x+y shall be equal to or a subset of the LCIDs 1…n;

- S: this field indicates that the transmission of the corresponding MTCH is to be suspended. The S field is set to 000. All other values are reserved.



Figure 6.1.3.7a-1: Extended MCH Scheduling Information MAC control element

#### ------------------------------------------- [End of the 3rd change] --------------------------------------------