**3GPP TSG-WG2 Meeting #109-e-bis *R2-200***

**Online, 20 April, 202 – 30 April, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **36.331** | **CR** | **4259** | **rev** | **1** | **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:***  | Correction on the configuration of subframe #0 and #5 for MCH in MBMS dedicated cell |
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| ***Source to WG:*** | Qualcomm Incorporated |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | LTE\_terr\_bcast-Core |  | ***Date:*** | 2020-04-29 |
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| ***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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | In dedicated MBMS cell, it should be possible to configure all subframes including subframe #0 and #5 as MBSFN subframe(s). However, (P)MCH cannot be scheduled in subframe #0 and #5. With the introduction of 3ms MBMS slot length (i.e., 0.37kHz subcarrier spacing) in Rel-16 (see R2-2001740), it is necessary that subframe #0 and #5 can be used for (P)MCH to improve network resource utilization.For example, when allocating MBSFN subframes in four consecutive radio frames, the subframe#0 of the first radio frame can be non-MBSFN subframe and rest can be configured as MBSFN subframes using the existing configuration, i.e., using the following signaling in SIB1-MBMS.NonMBSFN-SubframeConfig-r14 ::= SEQUENCE { radioFrameAllocationPeriod-r14 ENUMERATED {rf4, rf8, rf16, rf32, rf64, rf128, rf512}, radioFrameAllocationOffset-r14 INTEGER (0..7), subframeAllocation-r14 BIT STRING (SIZE(9))}In addition, the bitmap *sf-AllocInfo-r16* allows network to schedule the MCCH in any subframe (i.e., including subframes #0, #4, #5 and #9).However, the existing signaling structure for MCCH transmission (i.e., using *fourFrames* and *fourFrames-v1430*) does not allow network to configure the subframe #0 and #5 in an MBSFN area reducing the MBMS throughput. In other words, subframes of (P)MCH as indicated by the field *commonSF-Alloc* do not include the MBSFN subframes #0 and #5.

| *MBSFN-SubframeConfig* field descriptions |
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| ***fourFrames***A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #1, #2, #3, #6, #7, and #8 in the sequence of the four radio-frames.TDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #3, #4, #7, #8, and #9 in the sequence of the four radio-frames. The last four bits are not used. E-UTRAN allocates uplink subframes only if *eimta-MainConfig* is configured. |
| ***fourFrames-v1430***A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #4 and #9 in the sequence of the four radio-frames. |

When subcarrier spacing of 0.37kHz (i.e., MBMS slot length of 3 ms) is used, the throughput is reduced by 53.8% (i.e., only 6 MBMS slots out of 13 MBMS slots are usable for MCH) as shown in figure below.Therefore, it is important that MBMS area configuration (i.e., *MBSFNAreaConfiguration-r9*) provided in MCCH channel can schedule the (P)MCH in subframe#0 and #5. |
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| ***Summary of change:*** | Following changes are made. 1. The *MBSFNAreaConfiguration-r9* is extended to include *MBSFN- SubframeConfig-v16xy* to configure subframe #0 and #5 as MBSFN subframe.
2. Suffix in *commonSF-Alloc-r14* is corrected as *commonSF-Alloc-v1430* as this includes the configuration of additional subframes #4 and #9 without ignoring the configuration of *commonSF-Alloc-r9*, i.e., the field introduced in v1430 is a noncritical extension of r9 field.
3. Following clarification is added in the field description of *commonSF-Alloc*.

“If E-UTRAN includes *commonSF-Alloc-v1430* and/or *commonSF-Alloc-v16xy*, it includes the same number of entries, and listed in the same order, as in *commonSF-Alloc-r9*.” |
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| ***Consequences if not approved:*** | Network cannot use subframe #0 and #5 to schedule (P)MCH, thereby limiting the resource utilization. |
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| ***Clauses affected:*** | 6.2.2, 6.3.7 |
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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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| First change |

6.2.2 Message definitions

<skipped>

####  *MBSFNAreaConfiguration*

The *MBSFNAreaConfiguration* message contains the MBMS control information applicable for an MBSFN area. For each MBSFN area included in *SystemInformationBlockType13* E-UTRAN configures an MCCH (i.e. the MCCH identifies the MBSFN area) and signals the *MBSFNAreaConfiguration* message.

Signalling radio bearer: N/A

RLC-SAP: UM

Logical channel: MCCH

Direction: E‑UTRAN to UE

*MBSFNAreaConfiguration message*

-- ASN1START

MBSFNAreaConfiguration-r9 ::= SEQUENCE {

 commonSF-Alloc-r9 CommonSF-AllocPatternList-r9,

 commonSF-AllocPeriod-r9 ENUMERATED {

 rf4, rf8, rf16, rf32, rf64, rf128, rf256},

 pmch-InfoList-r9 PMCH-InfoList-r9,

 nonCriticalExtension MBSFNAreaConfiguration-v930-IEs OPTIONAL

}

MBSFNAreaConfiguration-v930-IEs ::= SEQUENCE {

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension MBSFNAreaConfiguration-v1250-IEs OPTIONAL

}

MBSFNAreaConfiguration-v1250-IEs ::= SEQUENCE {

 pmch-InfoListExt-r12 PMCH-InfoListExt-r12 OPTIONAL, -- Need OR

 nonCriticalExtension MBSFNAreaConfiguration-v1430-IEs OPTIONAL

}

MBSFNAreaConfiguration-v1430-IEs ::= SEQUENCE {

 commonSF-Alloc-v1430 CommonSF-AllocPatternList-v1430,

 nonCriticalExtension MBSFNAreaConfiguration-v16xy-IEs OPTIONAL

}

MBSFNAreaConfiguration-v16xy-IEs ::= SEQUENCE {

 commonSF-Alloc-v16xy CommonSF-AllocPatternList-v16xy OPTIONAL, -- Need OR

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

CommonSF-AllocPatternList-r9 ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig

CommonSF-AllocPatternList-v1430 ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig-v1430

CommonSF-AllocPatternList-v16xy ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig-v16xy

-- ASN1STOP

| *MBSFNAreaConfiguration* field descriptions |
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| ***commonSF-Alloc***Indicates the subframes allocated to the MBSFN area. E-UTRAN always sets this field to cover at least the subframes configured by *SystemInformationBlockType13* for this MCCH, regardless of whether any MBMS sessions are ongoing. E-UTRAN includes *commonSF-Alloc-v16xy* only when the cell is a MBMS-dedicated cell. If E-UTRAN includes *commonSF-Alloc-v1430* and/or *commonSF-Alloc-v16xy*, it includes the same number of entries, and listed in the same order, as in*commonSF-Alloc-r9*. |
| ***commonSF-AllocPeriod***Indicates the period during which resources corresponding with field *commonSF-Alloc* are divided between the (P)MCH that are configured for this MBSFN area. The subframe allocation patterns, as defined by *commonSF-Alloc*, repeat continously during this period. Value rf4 corresponds to 4 radio frames, rf8 corresponds to 8 radio frames and so on. The *commonSF-AllocPeriod* starts in the radio frames for which: SFN mod *commonSF-AllocPeriod* = 0. |
| ***pmch-InfoList***EUTRAN may include *pmch-InfoListExt* even if *pmch-InfoList* does not include *maxPMCH-PerMBSFN* entries. EUTRAN configures at most *maxPMCH-PerMBSFN* entries i.e. across *pmch-InfoList* and *pmch-InfoListExt*. |

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| Next change |

6.3.7 MBMS information elements

<skipped>

#### – *MBSFN-SubframeConfig*

The IE *MBSFN-SubframeConfig* defines subframes that are reserved for MBSFN in downlink.

*MBSFN-SubframeConfig* information element

-- ASN1START

MBSFN-SubframeConfig ::= SEQUENCE {

 radioframeAllocationPeriod ENUMERATED {n1, n2, n4, n8, n16, n32},

 radioframeAllocationOffset INTEGER (0..7),

 subframeAllocation CHOICE {

 oneFrame BIT STRING (SIZE(6)),

 fourFrames BIT STRING (SIZE(24))

 }

}

MBSFN-SubframeConfig-v1430 ::= SEQUENCE {

 subframeAllocation-v1430 CHOICE {

 oneFrame-v1430 BIT STRING (SIZE(2)),

 fourFrames-v1430 BIT STRING (SIZE(8))

 }

}

MBSFN-SubframeConfig-v16xy ::= SEQUENCE {

 subframeAllocation-v16xy CHOICE {

 oneFrame-v16xy BIT STRING (SIZE(2)),

 fourFrames-v16xy BIT STRING (SIZE(8))

 }

}

-- ASN1STOP

| *MBSFN-SubframeConfig* field descriptions |
| --- |
| ***fourFrames***A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #1, #2, #3, #6, #7, and #8 in the sequence of the four radio-frames.TDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #3, #4, #7, #8, and #9 in the sequence of the four radio-frames. The last four bits are not used. E-UTRAN allocates uplink subframes only if *eimta-MainConfig* is configured. |
| ***fourFrames-v1430, fourFrames-v16xy***A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation indicated by *fourFrames-v1430* applies to subframes #4 and #9 in the sequence of the four radio-frames. Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation indicated by *fourFrames-v16xy*, if present, applies to subframes #0 and #5 in the sequence of the four radio-frames. |
| ***oneFrame***"1" denotes that the corresponding subframe is allocated for MBSFN. The following mapping applies:FDD: The first/leftmost bit defines the MBSFN allocation for subframe #1, the second bit for #2, third bit for #3, fourth bit for #6, fifth bit for #7, sixth bit for #8.TDD: The first/leftmost bit defines the allocation for subframe #3, the second bit for #4, third bit for #7, fourth bit for #8, fifth bit for #9. E-UTRAN allocates uplink subframes only if *eimta-MainConfig* is configured. The last bit is not used. |
| ***oneFrame-v1430, oneFrame-v16xy***"1" denotes that the corresponding subframe is allocated for MBSFN. The following mapping applies:FDD: The first/leftmost bit indicated by *oneFrame-v1430* defines the MBSFN allocation for subframe #4 and the second bit for #9. The first/leftmost bit indicated by *oneFrame-v16xy*, if present,defines the MBSFN allocation for subframe #0 and the second bit for #5. |
| ***radioFrameAllocationPeriod, radioFrameAllocationOffset***Radio-frames that contain MBSFN subframes occur when equation *SFN* mod *radioFrameAllocationPeriod* = *radioFrameAllocationOffset*is satisfied. Value n1 for *radioframeAllocationPeriod* denotes value 1, n2 denotes value 2, and so on. When *fourFrames* is used for *subframeAllocation*, the equation defines the first radio frame referred to in the description below. Values *n1* and *n2* are not applicable when *fourFrames* is used. |
| ***subframeAllocation***Defines the subframes that are allocated for MBSFN within the radio frame allocation period defined by the *radioFrameAllocationPeriod* and the *radioFrameAllocationOffset.* |

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| End of change |