**3GPP TSG-WG2 Meeting #110-e *R2-200xxxx***

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **06** | **CR** | **1764** | **rev** | **1** | **Current version:** |  |  |
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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:***  | MBMS UE capabilities per band for subcarrier spacing of 2.5 kHz and 0.37 kHz |
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| ***Source to WG:*** | Qualcomm Technologies Int |
| ***Source to TSG:*** |   |
|  |  |
| ***Work item code:*** | LTE\_terr\_bcast-Core |  | ***Date:*** | 2020-0 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | -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:*** | Two new subcarrier spacings (2.5kHz and 0.37kHz) and corresponding capability signaling per UE were introduced in Rel-16 LTE-based 5G terrestrial broadcast in RP-200363. However, RAN1 has sent LS in R2-2004357 on the updated RAN1 UE feature list. Therefore, RAN2 needs to update the UE capability signaling from per UE to per supported band for support of subcarrier spacing of 2.5kHz and 0.37kHz. RAN1 has also sent LS in R2-2006033 to add clarification on the support of larger TBS for the subcarrier spacing of 0.37kHz. |
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| ***Summary of change:*** | Following changes are made. 1. Reference to subclause in RAN1 spec is added in section 4 according to TP in the LS from RAN1.
2. *subcarrierSpacingMBMS-khz0dot37-r16* and *subcarrierSpacingMBMS-khz2dot5-r16* are added to indicate supported subcarrier spacing in the band.
3. *mbms-ScalingFactor0dot37-r16*, *mbms-ScalingFactor2dot5-r16* are updated to be applicable for all supported bands.
4. *timeSeparationSlot2-r16*, *timeSeparationSlot4-r16* are updated to be applicable per supported band.
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| ***Consequences if not approved:*** | UE cannot report the per band capability for support of subcarrier spacing of 2.5kHz and 0.37kHz. |
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| ***Clauses affected:*** | 4, 4.3.17.6x(new), 4.3.17.9, 4.3.17.10 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS/TR 36.331 CR 4307 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** | This is revision of R2-2005227. |

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| Start of change |

# 4 UE radio access capability parameters

The following clauses define the UE radio access capability parameters and minimum capabilities for MBMS capable UE. Only parameters for which there is the possibility for UEs to signal different values are considered as UE radio access capability parameters. Therefore, mandatory features without capability parameters that are the same for all UEs are not listed here. Also capabilities which are optional or conditionally mandatory for UEs to implement but do not have UE radio access capability parameter are listed in this specification.

E-UTRAN needs to respect the signalled UE radio access capability parameters when configuring the UE and when scheduling the UE.

All parameters shown in italics are signalled and correspond to a field defined in TS 36.331 [5].

For optional features, the UE radio access capability parameter indicates whether the feature has been implemented and successfully tested. For mandatory features with the UE radio access capability parameter, the parameter indicates whether the feature has been successfully tested.

The mandatory features required to be supported by a UE are the same for all UE categories unless explicitly specified elsewhere in the specifications.

Unless otherwise stated, the requirements on the maximum number of transport block bits are applicable for a TTI length of 1 ms. For other TTI lengths, the requirements shall be scaled according to clause 7.1.7 or 11.1 in TS 36.213 [22] in order to get the corresponding requirement.

The following UE radio access capability parameters specified in Chapter 4 are applicable in NB-IoT:

- *ue-Category-NB* in NB-IoT (clause 4.1C)

- *supportedROHC-Profiles-r13* (clause 4.3.1.1A)

- *maxNumberROHC-ContextSessions-r13* (clause 4.3.1.2A)

- *rlc-UM-r15 (*clause *4.3.2.5)*

- *multiTone-r13* (clause 4.3.4.55)

- *multiCarrier-r13* (clause 4.3.4.56)

- *twoHARQ-Processes-r14* (clause 4.3.4.62)

- *multiCarrier-NPRACH-r14* (clause 4.3.4.75)

- *multiCarrierPaging-r14* (clause 4.3.4.76)

- *interferenceRandomisation-r14* (clause 4.3.4.80)

- *wakeUpSignal-r15* (clause 4.3.4.113)

- *wakeUpSignalMinGap-eDRX-r15* (clause 4.3.4.114)

- *mixedOperationMode-r15* (clause 4.3.4.115)

- *sr-WithHARQ-ACK-r15* (clause 4.3.4.117)

- *sr-WithoutHARQ-ACK-r15* (clause 4.3.4.118)

- *nprach-Format2-r15* (clause 4.3.4.119)

- *multiCarrierPagingTDD-r15* (clause 4.3.4.134)

- *additionalTransmissionSIB1-r15* (clause 4.3.4.137)

- *npusch-3dot75kHz-SCS-TDD-r15* (clause 4.3.4.177)

- *multiTB-UL-r16* (clause 4.3.4.182)

- *multiTB-DL-r16* (clause 4.3.4.183)

- *supportedBandList-r13* (clause 4.3.5.1A)

- *multiNS-Pmax-r13* (clause 4.3.5.16A)

- *powerClassNB-20dBm-r13* (clause 4.3.5.1A.1)

- *powerClassNB-14dBm-r14* (clause 4.3.5.1A.2)

- *dl*-*ChannelQualityReporting-r16* (clause 4.3.6.37)

- *accessStratumRelease-r13* (clause 4.3.8.1A)

- *multipleDRB-r13* (clause 4.3.8.5)

- *earlyData-UP-r15* (clause 4.3.8.7)

- *earlySecurityReactivation-r16* (clause 4.3.8.11)

- *pur-CP-r16* (clause 4.3.8.12)

- *pur-UP-r16* (clause 4.3.8.13)

- *anr-Report-r16* (clause 4.3.12.2)

- *logicalChannelSR-ProhibitTimer* (clause 4.3.19.2)

- *dataInactMon-r14* (clause 4.3.19.9)

- *rai-Support-r14* (clause 4.3.19.10)

- *earlyContentionResolution-r14* (clause 4.3.19.14)

- *sr-SPS-BSR-r15* (clause 4.3.19.15)

- *rai-SupportEnh-r16* (clause 4.3.19.22)

- *earlyData-UP-5GC-r16* (clause 4.3.36.9)

The UE radio access capabilities specified in Chapter 4 are not applicable in NB-IoT, unless they are listed above.

The following optional features without UE radio access capability parameters specified in Chapter 6 are applicable in NB-IoT:

- RRC Connection Re-establishment for the Control Plane CIoT EPS Optimization (clause 6.7.5)

- DL channel quality reporting in MSG3 for non-anchor carrier (clause 6.7.6)

- System Information Block Type 16 (clause 6.8.1)

- Enhanced random access power control (clause 6.8.3)

- MT-EDT for Control Plane CIoT EPS Optimisation (clause 6.8.10)

- MT-EDT for User Plane CIoT EPS Optimisation (clause 6.8.11)

- EDT for Control Plane CIoT EPS Optimization (clause 6.8.4)

- Enhanced PHR (clause 6.8.6)

- SC-PTM in Idle mode (clause 6.16.1)

- Relaxed monitoring (clause 6.17.1)

- DL channel quality reporting (clause 6.17.2)

- Serving cell idle mode measurements reporting (clause 6.17.3)

- NSSS-Based RRM measurements (clause 6.17.4)

- NPBCH-Based RRM measurements (clause 6.17.5)

- RRM measurements on non-anchor paging carriers (clause 6.17.6)

- User Plane CIoT 5GS optimisations (clause 6.18.1)

The optional features without UE radio access capability parameters specified in Chapter 6 are not applicable in NB-IoT, unless they are listed above.

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| Next change |

### 4.3.17 MBMS parameters

#### 4.3.17.1 *mbms-SCell-r11*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via MBSFN on a frequency indicated in an *MBMSInterestIndication* message, when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated), as specified in TS 36.331 [5].

#### 4.3.17.2 *mbms-NonServingCell-r11*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via MBSFN on a frequency indicated in an *MBMSInterestIndication* message, where (according to *supportedBandCombination* and to network synchronization properties) a serving cell may be additionally configured, as specified in TS 36.331 [5]. If this is supported, the UE shall also support MBMS reception via MBSFN on a frequency when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated), as specified in TS 36.331 [5].

#### 4.3.17.3 *mbms-AsyncDC-r12*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via MBSFN on a frequency indicated in an *MBMSInterestIndication* message, where according to *supportedBandCombination*, the carriers are configured or can be configured as serving cells in the MCG and the SCG which are not synchronized, specified in TS 36.331 [5]. In this release of specification, it is mandatory to support this according to *MBMSInterestIndication* and indicated *supportedBandCombination*.

#### 4.3.17.4 *fembmsMixedCell-r14*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception with 15kHz subcarrier spacings via MBSFN from FeMBMS/Unicast mixed cells on a frequency indicated in an *MBMSInterestIndication* message.

#### 4.3.17.5 *fembmsDedicatedCell-r14*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception with 15kHz subcarrier spacings via MBSFN from MBMS-dedicated cells on a frequency indicated in an *MBMSInterestIndication* message.

#### 4.3.17.6 *subcarrierSpacingMBMS-khz1dot25-r14, subcarrierSpacingMBMS-khz7dot5-r14*

This parameter defines the supported subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing. The *subcarrierSpacingMBMS-khz7dot5-r14* refers to 7.5kHz subcarrier spacing and *subcarrierSpacingMBMS-khz1dot25-r14* refers to 1.25 kHz subcarrier spacing as defined in TS 36.211 [21], clause 6.12. This field is included only if UE supports MBMS reception from FeMBMS/Unicast mixed cell or MBMS-dedicated cell.

#### 4.3.17.6x *subcarrierSpacingMBMS-khz0dot37-r16, subcarrierSpacingMBMS-khz2dot5-r16*

This parameter defines for each supported E-UTRA band the supported subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing. The *subcarrierSpacingMBMS-khz0dot37-r16* refers to 0.37 kHz subcarrier spacing and *subcarrierSpacingMBMS-khz2dot5-r16* refers to 2.5 kHz subcarrier spacing as defined in TS 36.211 [21], clause 6.12. This field is included only if UE supports MBMS reception from FeMBMS/Unicast mixed cell or MBMS-dedicated cell for the supported E-UTRA band.

#### 4.3.17.7 *mbms-MaxBW-r14*

This parameter defines the maximum supported bandwidth (T) for MBMS reception, see TS 36.213 [22], clause 11.1. If the value is set to *implicitValue*, the corresponding value of T is calculated as specified in TS 36.213 [22], clause 11.1. If the value is set to *explicitValue*, the actual value of T = *explicitValue* \* 40 MHz.

#### 4.3.17.8 *mbms-ScalingFactor1dot25-r14*, *mbms-ScalingFactor7dot5-r14*

These parameters correspond to A(1.25 and A(7.5, respectively, i.e., scaling factor for processing one unit of bandwidth corresponding to subcarrier spacing of 1.25 kHz and 7.5 kHz, with respect to one unit of bandwidth corresponding to subcarrier spacing of 15 kHz. See TS 36.213 [22], clause 11.1. The field is included only if UE supports corresponding subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing. The field shall be included if the UE supports corresponding subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing and *mbms-MaxBW-r14* is included.

4.3.17.9 *mbms-ScalingFactor0dot37-r16*, *mbms-ScalingFactor2dot5-r16*

These parameters correspond to A(0.37 / A(2..5, i.e., scaling factor for processing one unit of bandwidth corresponding to subcarrier spacing of 0.37 kHz / 2.5 kHz, with respect to one unit of bandwidth corresponding to subcarrier spacing of 15 kHz. See TS 36.213 [22], clause 11.1. This field is included only if UE supports MBMS reception from FeMBMS/Unicast mixed cell or MBMS-dedicated cell. This field shall be included if *subcarrierSpacingMBMS-khz0dot37-r16 / subcarrierSpacingMBMS-khz2dot5-r16* is included for at least one supported E-UTRA band.

4.3.17.10 *timeSeparationSlot2-r16, timeSeparationSlot4-r16*

These parameters define for each supported E-UTRA band the supported time staggering length of 2 slots (MBSFN reference signal pattern type 2) / 4 slots (MBSFN reference signal pattern type 1) for MBSFN-RS associated with PMCH with subcarrier spacing of 0.37 kHz for MBSFN subframes as described in TS 36.211 [17], clause 6.10.2.2.4. This field is included only if UE supports subcarrier spacing of 0.37 kHz for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing.

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| End of change |