**3GPP TSG-RAN WG2 Meeting #121bis-e *R2-xxxxxxx***

Online, Apr 17th – Apr 26th, 2023

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.331** | **CR** | **3977** | **rev** | **1** | **Current version:** | **17.4.0** |  |
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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 |  | Core Network |  |

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| ***Title:*** | Clarification to TS 38.331 on Enhanced BFR MAC CE for feMIMO | | | | | | | | | |
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| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_feMIMO-Core | | | | |  | ***Date:*** | | | 2023-4-23 |
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| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | Issue 1:  According to TS 38.321, if CBRA is triggered for SpCell beam failure recovery and *spCell-BFR-CBRA* with value *true* is configured, UE will send the Enhanced BFR MAC CE to the gNB provided that at least one Serving Cell of the MAC entity is configured with two BFD-RS sets, i.e. the *spCell-BFR-CBRA* is also used to control whether the Enhanced BFR MAC CE can be sent to the gNB in the CBRA procedure. While the field description of *spCell-BFR-CBRA* in TS 38.331 only covers the control of sending the BFR MAC CE for SpCell BFR by this field, which does not aligns with TS 38.321.  Issue 2:  According to TS 38.321, the decision of the Candidate RS ID in the Enhanced BFR MAC CE is also based on the RRC parameter *rsrp-ThresholdBFR* configured by *BeamFailureRecoveryRSConfig.* But in the field description of *rsrp-ThresholdBFR,* it only mentions that the *rsrp-ThresholdBFR* is used to determine the candidate beam included in the BFR MAC CE, which does not align with TS 38.321. | | | | | | | | |
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| ***Summary of change:*** | | Change 1:  In 6.3.2 of TS 38.331, change “BFR MAC CE for SpCell BFR” into “MAC CE for SpCell BFR” in the field description of *spCell-BFR-CBRA*.  Change 2:  In 6.3.2 of TS 38.331, change “included by the UE in BFR MAC CE (see TS 38.213 [13], clause 6)” to “included by the UE in MAC CE for BFR (see TS 38.321 [3] and TS 38.213 [13], clause 6)” in the field description of rsrp-ThresholdBFR.    **Impact analysis**  Impacted 5G architecture options:  NR SA, NR-DC, NE-DC, (NG)EN-DC  Impacted functionality:  feMIMO  Inter-operability:  There are no inter-operability issues foreseen. | | | | | | | | |
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| ***Consequences if not approved:*** | | - There exists mis-match description between TS 38.331 and TS 38.321 related to the MAC CE for BFR. | | | | | | | | |
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| ***Clauses affected:*** | | 6.3.2 | | | | | | | | |
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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:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

*Start of Modification*

*– BeamFailureRecoveryConfig*

The IE *BeamFailureRecoveryConfig* is used to configure the UE with RACH resources and candidate beams for beam failure recovery in case of beam failure detection. See also TS 38.321 [3], clause 5.1.1.

***BeamFailureRecoveryConfig* information element**

-- ASN1START

-- TAG-BEAMFAILURERECOVERYCONFIG-START

BeamFailureRecoveryConfig ::= SEQUENCE {

rootSequenceIndex-BFR INTEGER (0..137) OPTIONAL, -- Need M

rach-ConfigBFR RACH-ConfigGeneric OPTIONAL, -- Need M

rsrp-ThresholdSSB RSRP-Range OPTIONAL, -- Need M

candidateBeamRSList SEQUENCE (SIZE(1..maxNrofCandidateBeams)) OF PRACH-ResourceDedicatedBFR OPTIONAL, -- Need M

ssb-perRACH-Occasion ENUMERATED {oneEighth, oneFourth, oneHalf, one, two,

four, eight, sixteen} OPTIONAL, -- Need M

ra-ssb-OccasionMaskIndex INTEGER (0..15) OPTIONAL, -- Need M

recoverySearchSpaceId SearchSpaceId OPTIONAL, -- Need R

ra-Prioritization RA-Prioritization OPTIONAL, -- Need R

beamFailureRecoveryTimer ENUMERATED {ms10, ms20, ms40, ms60, ms80, ms100, ms150, ms200} OPTIONAL, -- Need M

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msg1-SubcarrierSpacing SubcarrierSpacing OPTIONAL -- Need M

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[[

ra-PrioritizationTwoStep-r16 RA-Prioritization OPTIONAL, -- Need R

candidateBeamRSListExt-v1610 SetupRelease{ CandidateBeamRSListExt-r16 } OPTIONAL -- Need M

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[[

spCell-BFR-CBRA-r16 ENUMERATED {true} OPTIONAL -- Need R

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}

PRACH-ResourceDedicatedBFR ::= CHOICE {

ssb BFR-SSB-Resource,

csi-RS BFR-CSIRS-Resource

}

BFR-SSB-Resource ::= SEQUENCE {

ssb SSB-Index,

ra-PreambleIndex INTEGER (0..63),

...

}

BFR-CSIRS-Resource ::= SEQUENCE {

csi-RS NZP-CSI-RS-ResourceId,

ra-OccasionList SEQUENCE (SIZE(1..maxRA-OccasionsPerCSIRS)) OF INTEGER (0..maxRA-Occasions-1) OPTIONAL, -- Need R

ra-PreambleIndex INTEGER (0..63) OPTIONAL, -- Need R

...

}

CandidateBeamRSListExt-r16::= SEQUENCE (SIZE(1.. maxNrofCandidateBeamsExt-r16)) OF PRACH-ResourceDedicatedBFR

-- TAG-BEAMFAILURERECOVERYCONFIG-STOP

-- ASN1STOP

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| ***BeamFailureRecoveryConfig* field descriptions** |
| ***beamFailureRecoveryTimer***  Timer for beam failure recovery timer. Upon expiration of the timer the UE does not use CFRA for BFR. Value in ms. Value *ms10* corresponds to 10 ms, value *ms20* corresponds to 20 ms, and so on. |
| ***candidateBeamRSList, candidateBeamRSListExt-v1610***  Set of reference signals (CSI-RS and/or SSB) identifying the candidate beams for recovery and the associated RA parameters. This set includes all elements of *candidateBeamRSList* (without suffix) and all elements of *candidateBeamRSListExt-v1610*. The UE maintains *candidateBeamRSList* and *candidateBeamRSListExt-v1610* separately: Receiving *candidateBeamRSListExt-v1610* set to *release* releases only the entries that were configured by *candidateBeamRSListExt-v1610*, and receiving *candidateBeamRSListExt-v1610* set to *setup* replaces only the entries that were configured by *candidateBeamRSListExt-v1610* with the newly signalled entries. The network configures these reference signals to be within the linked DL BWP (i.e., within the DL BWP with the same *bwp-Id*) of the UL BWP in which the *BeamFailureRecoveryConfig* is provided. |
| ***msg1-SubcarrierSpacing***  Subcarrier spacing for contention free beam failure recovery (see TS 38.211 [16], clause 5.3.2).  Only the following values are applicable depending on the used frequency:  FR1: 15 or 30 kHz  FR2-1: 60 or 120 kHz  FR2-2: 120, 480, or 960 kHz |
| ***rsrp-ThresholdSSB***  L1-RSRP threshold used for determining whether a candidate beam may be used by the UE to attempt contention free random access to recover from beam failure (see TS 38.213 [13], clause 6). |
| ***ra-prioritization***  Parameters which apply for prioritized random access procedure for BFR (see TS 38.321 [3], clause 5.1.1). |
| ***ra-PrioritizationTwoStep***  Parameters which apply for prioritized 2-step random access procedure for BFR (see TS 38.321 [3], clause 5.1.1). |
| ***ra-ssb-OccasionMaskIndex***  Explicitly signalled PRACH Mask Index for RA Resource selection in TS 38.321 [3]. The mask is valid for all SSB resources. |
| ***rach-ConfigBFR***  Configuration of random access parameters for BFR. |
| ***recoverySearchSpaceId***  Search space to use for BFR RAR. The network configures this search space to be within the linked DL BWP (i.e., within the DL BWP with the same *bwp-Id*) of the UL BWP in which the *BeamFailureRecoveryConfig* is provided. The CORESET associated with the recovery search space cannot be associated with another search space. Network always configures the UE with a value for this field when contention free random access resources for BFR are configured. |
| ***rootSequenceIndex-BFR***  PRACH root sequence index (see TS 38.211 [16], clause 6.3.3.1) for beam failure recovery. |
| ***spCell-BFR-CBRA***  Indicates that UE is configured to send MAC CE for SpCell BFR as specified in TS38.321 [3]. |
| ***ssb-perRACH-Occasion***  Number of SSBs per RACH occasion for CF-BFR, see TS 38.213 [13], clause 8.1. |

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| ***BFR-CSIRS-Resource* field descriptions** |
| ***csi-RS***  The ID of a *NZP-CSI-RS-Resource* configured in the *CSI-MeasConfig* of this serving cell. This reference signal determines a candidate beam for beam failure recovery (BFR). |
| ***ra-OccasionList***  RA occasions that the UE shall use when performing BFR upon selecting the candidate beam identified by this CSI-RS. The network ensures that the RA occasion indexes provided herein are also configured by *prach-ConfigurationIndex* and *msg1-FDM*. Each RACH occasion is sequentially numbered, first, in increasing order of frequency resource indexes for frequency multiplexed PRACH occasions; second, in increasing order of time resource indexes for time multiplexed PRACH occasions within a PRACH slot and Third, in increasing order of indexes for PRACH slots.  If the field is absent the UE uses the RA occasion associated with the SSB that is QCLed with this CSI-RS. |
| ***ra-PreambleIndex***  The RA preamble index to use in the RA occasions associated with this CSI-RS. If the field is absent, the UE uses the preamble index associated with the SSB that is QCLed with this CSI-RS. |

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| ***BFR-SSB-Resource* field descriptions** |
| ***ra-PreambleIndex***  The preamble index that the UE shall use when performing BFR upon selecting the candidate beams identified by this SSB. |
| ***ssb***  The ID of an SSB transmitted by this serving cell. It determines a candidate beam for beam failure recovery (BFR). |

*Next Modification*

*– BeamFailureRecoveryRSConfig*

The IE *BeamFailureRecoveryRSConfig* is used to configure the UE with candidate beams for beam failure recovery in case of beam failure detection. See also TS 38.321 [3], clause 5.17.

***BeamFailureRecoveryRSConfig* information element**

-- ASN1START

-- TAG-BEAMFAILURERECOVERYRSCONFIG-START

BeamFailureRecoveryRSConfig-r16 ::= SEQUENCE {

rsrp-ThresholdBFR-r16 RSRP-Range OPTIONAL, -- Need M

candidateBeamRS-List-r16 SEQUENCE (SIZE(1..maxNrofCandidateBeams-r16)) OF CandidateBeamRS-r16 OPTIONAL, -- Need M

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candidateBeamRS-List2-r17 SEQUENCE (SIZE(1..maxNrofCandidateBeams-r16)) OF CandidateBeamRS-r16 OPTIONAL -- Need R

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}

-- TAG-BEAMFAILURERECOVERYRSCONFIG-STOP

-- ASN1STOP

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| ***BeamFailureRecoveryRSConfig* field descriptions** |
| ***candidateBeamRS-List***  A list of reference signals (CSI-RS and/or SSB) identifying the candidate beams for recovery. The network always configures this parameter in every instance of this IE. |
| ***candidateBeamRS-List2***  A list of reference signals (CSI-RS and/or SSB) identifying the candidate beams for recovery. |
| ***rsrp-ThresholdBFR***  L1-RSRP threshold used for determining whether a candidate beam may be included by the UE in MAC CE for BFR (see TS 38.321 [3] and TS 38.213 [13], clause 6). The network always configures this parameter in every instance of this IE. |

*End of Modificatcion*