**3GPP TSG-RAN WG2 Meeting #127 *R2-2407880***

**Maastricht, Netherlands, Aug 19 – 23, 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **38.331** | **CR** | **4912** | **rev** | **2** | **Current version:** | **18.2.0** |  |
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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 featureCombination and SI-RequestConfig |
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| ***Source to WG:*** | ZTE Corporation, Ericsson, LG Electronics Inc. |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | NR\_newRAT-Core, TEI17 |  | ***Date:*** | 2024-08-09 |
|  |  |  |  |  |
| ***Category:*** | **A** |  | ***Release:*** | Rel-18 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | 1. Based on the analysis in R2-2406411, featureCombination with empty content cannot be used for future extension, and there is no need to configure featureCombination with empty content to provide the legacy RACH resource set (e.g. RACH resource set that not associated with any feature), to avoid inter-operability issue, it is better to make it clear in spec that empty featureCombination IE is not allowed when configured in featureCombinationPreambles.
2. Currently, SI-RequestConfig IE does not include some common prach parameters (e.g. prach-RootSequenceIndex, msg1-SubcarrierSpacing…), so, when network configures multiple RACH partitions with separate RO, and different set of common PRACH parameters are configured, it is unclear which common parameters should be applied by the UE when RACH is triggered for Msg1 based SI request.

In RAN2#126 meeting, for SI-request with Msg1 repetition, RAN2 agreed that the UE should apply the parameters corresponding to the RACH resource set selected upon RACH initialization procedure specified in TS 38.321 and agreed CR R2-2406024. For SI-request without Msg1 repetition, the similar principle can also be applied. Therefore, no matter rach-OccasionsSI is configured or not, for SI-RequestConfig, the UE should apply the paramters (e.g. prach-RootSequenceIndex, msg1-SubcarrierSpacing, etc) configured in rach-ConfigCommon corresponding to the RACH resource set selected upon RACH initialization as specified in MAC spec. (Based on the agreement made in RAN2#126, the parameters are from the RACH resource set that not associated with any feature)  |
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| ***Summary of change:*** | 1. Clarify in the field description of featureCombination, that netowrk ensures at least one sub-field should be present.
2. Add below clarification to the IE description of SI-RequestConfig.

For the random access parameters (e.g. *prach-RootSequenceIndex*, *msg1-SubcarrierSpacing*, etc.) not configured in *SI-RequestConfig*, the UE applies the parameters configured in *rach-ConfigCommon* corresponding to the RACH resource set selected upon RACH initialization (as specified in TS 38.321 [3]), of the initial uplink BWP unless otherwise specified.**Impact analysis**Impacted 5G architecture options:NR SA, (NG)EN-DC, NR-DC, NE-DCImpacted functionality:RACH partitioning, Msg1 based SI-requestInter-operability:For change #1* If the network is implemented according to the CR and the UE is not, there is no inter-operability issue;
* If the UE is implemented according to the CR and the network is not, when the network configures a RACH partition with empty featureCombination, the UE’s behaviour is unclear, the UE may select the RACH resource set when MAC procedure indicates to select the RACH resource set that not associated with any feature. The UE may trigger RRC re-establishment if the UE considers the configuration as invalid.

For change #2* If the network is implemented according to the CR and the UE is not, or if the UE is implemented according to the CR and the network is not, when network configures multiple RACH partitions with different value of parameters (e.g. prach-RootSequenceIndex, msg1-SubcarrierSpacing...) it is unclear which set of parameters will be applied by the UE for SI-Request without Msg1 repetition and the RACH procedure may fail.
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| ***Consequences if not approved:*** | 1. It is unclear whether featureCombination with empty content can be configured or not, and what’s the expected UE behaviour;
2. It is unclear which PRACH parameters (e.g. prach-RootSequenceIndex, msg1-SubcarrierSpacing...) should be applied for SI request without Msg1 repetition when network configures multiple RACH partitions.
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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:*** | Coversheet update by MCC: Wrong rev value (0->2). |
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| ***This CR's revision history:*** |  |

***Start of change***

### 6.3.2 Radio resource control information elements

\*\*\*ignore non-related part\*\*\*

#### – *FeatureCombinationPreambles*

The IE *FeatureCombinationPreambles* associatesa set of preambles with a feature combination. For parameters which can be provided in this IE, the UE applies this field value when performing Random Access using a preamble in this featureCombinationPreambles, otherwise the UE applies the corresponding value as determined by applicable Need Code, e.g. Need S. On a specific BWP, there can be at most one set of preambles associated with a given feature combination per RA Type (i.e. 4-step RACH or 2-step RACH) per MSG1 repetition number.

*FeatureCombinationPreambles* information element

-- ASN1START

-- TAG-FEATURECOMBINATIONPREAMBLES-START

FeatureCombinationPreambles-r17 ::= SEQUENCE {

 featureCombination-r17 FeatureCombination-r17,

 startPreambleForThisPartition-r17 INTEGER (0..63),

 numberOfPreamblesPerSSB-ForThisPartition-r17 INTEGER (1..64),

 ssb-SharedRO-MaskIndex-r17 INTEGER (1..15) OPTIONAL, -- Need S

 groupBconfigured-r17 SEQUENCE {

 ra-SizeGroupA-r17 ENUMERATED {b56, b144, b208, b256, b282, b480, b640,

 b800, b1000, b72, spare6, spare5,spare4, spare3, spare2, spare1},

 messagePowerOffsetGroupB-r17 ENUMERATED { minusinfinity, dB0, dB5, dB8, dB10, dB12, dB15, dB18},

 numberOfRA-PreamblesGroupA-r17 INTEGER (1..64)

 } OPTIONAL, -- Need R

 separateMsgA-PUSCH-Config-r17 MsgA-PUSCH-Config-r16 OPTIONAL, -- Cond MsgAConfigCommon

 msgA-RSRP-Threshold-r17 RSRP-Range OPTIONAL, -- Need R

 rsrp-ThresholdSSB-r17 RSRP-Range OPTIONAL, -- Need R

 deltaPreamble-r17 INTEGER (-1..6) OPTIONAL, -- Need R

 ...,

 [[

 msg1-RepetitionNum-r18 ENUMERATED {n2, n4, n8, spare1} OPTIONAL, -- Cond Msg1Rep2

 msg1-RepetitionTimeOffsetROGroup-r18 ENUMERATED {n4, n8, n16, spare1} OPTIONAL -- Cond Msg1Rep3

 ]]

}

-- TAG-FEATURECOMBINATIONPREAMBLES-STOP

-- ASN1STOP

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| *FeatureCombinationPreambles* field descriptions |
| ***deltaPreamble***Power offset between msg3 or msgA-PUSCH and RACH preamble transmission. If configured, this parameter overrides *msg3-DeltaPreamble* or *msgA-DeltaPreamble*, Actual value = field value \* 2 [dB] (see TS 38.213 [13], clause 7.1). If *msgA-DeltaPreamble* is configured in *separateMsgA-PUSCH-Config-r17*, this field is absent. This field is set to the same value for all *FeatureCombinationPreambles* for MSG1 repetitions. |
| ***featureCombination***Indicates which combination of features that the preambles indicated by this IE are associated with. Network ensures at least one field within the *featureCombination* is configured. The UE ignores a RACH resource defined by this *FeatureCombinationPreambles* if any feature within the *featureCombination* is not supported by the UE or if any of the spare fields within the *featureCombination* is set to *true*. |
| ***messagePowerOffsetGroupB***Threshold for preamble selection. Value is in dB. Value *minusinfinity* corresponds to –infinity. Value *dB0* corresponds to 0 dB, *dB5* corresponds to 5 dB and so on (see TS 38.321 [3], clause 5.1.2). |
| ***msg1-RepetitionNum***Indicates which MSG1-repetition number that this *FeatureCombinationPreambles* is associated with. |
| ***msg1-RepetitionTimeOffsetROGroup***Indicates a time offset of the starting ROs between two successive RO groups for a given repetition number (2, 4 or 8) associated with this *FeatureCombinationPreambles* for each frequency resource index within a time period (see TS 38.213 [13]). If this field is absent, the time offset is implicitly determined (see TS 38.213 [13]).For each MSG1 repetition number, the following values are applicable.• {n16}, for RO groups for MSG1 repetition number 8• {n8, n16}, for RO groups for MSG1 repetition number 4• {n4, n8, n16}, for RO groups for MSG1 repetition number 2 |
| ***msgA-RSRP-Threshold***The UE selects 2-step random access type to perform random access based on this threshold (see TS 38.321 [3], clause 5.1.1). This field is only present if both 2-step and 4-step RA type are configured for the concerned feature combination in the BWP. If configured, this parameter overrides *msgA-RSRP-Threshold-r16*. If absent, the UE applies *msgA-RSRP-Threshold-r16*, if configured |
| ***numberOfPreamblesPerSSB-ForThisPartition***It determines how many consecutive preambles are associated to the Feature Combination starting from the starting preamble(s) per SSB. |
| ***numberOfRA-PreamblesGroupA***It determines how many consecutive preambles per SSB are associated to Group A starting from the starting preamble(s). The remaining preambles associated to the Feature Combination are associated to Group B |
| ***ra-SizeGroupA***Transport Blocks size threshold in bits below which the UE shall use a contention-based RA preamble of group A. (see TS 38.321 [3], clause 5.1.2). If this feature combination preambles are associated to a *RACH-ConfigCommon-twostepRA*, this field correspond to *ra-MsgA-SizeGroupA*, otherwise it corresponds to *ra-Msg3SizeGroupA*. |
| ***rsrp-ThresholdSSB***UE may select the SS block and corresponding PRACH resource for path-loss estimation and (re)transmission based on SS blocks that satisfy the threshold (see TS 38.213 [13]). If this parameter is included in *FeatureCombinationPreambles* which is included in *RACH-ConfigCommonTwoStepRA*, it corresponds to *msgA-RSRP-ThresholdSSB*, as defined in TS 38.321 [3]. If this parameter is included in *FeatureCombinationPreambles* which is included in *RACH-ConfigCommon*, it it corresponds to *rsrp-ThresholdSSB*, as defined in TS 38.321 [3]. |
| ***separateMsgA-PUSCH-Config***If present, it specifies how the 2-step RACH preambles identified by this *FeatureCombinationPreambles* are mapped to a PUSCH slot separate from the one defined in MsgA-ConfigCommon-r16. If the field is absent, the UE should apply the corresponding parameter in the *RACH-ConfigCommonTwoStepRA* of the BWP which includes the *FeatureCombinationPreambles IE*. |
| ***ssb-SharedRO-MaskIndex***Mask index (see TS 38.321 [3]).Indicates a subset of ROs where preambles are allocated for this feature combination.If this field is configured within *FeatureCombinationPreambles* which is included in *RACH-ConfigCommonTwoStepRA*:- in case of separate ROs are configured for 4-step and 2-step random access, this field indicates a subset of ROs configured within this *RACH-ConfigCommonTwoStepRA*;- in case shared ROs are used for 4-step and 2-step random access, it indicates the subset of ROs configured within *RACH-ConfigCommon*, which are the subset of ROs configured for 2-step random access.This field is configured when there is more than one RO per SSB. If the field is absent, all ROs configured in *RACH-ConfigCommon* or *RACH-ConfigCommonTwoStepRA* containing this *FeatureCombinationPreambles* are shared. The network does not configure this field, if the field *msg1-RepetitionNum* is configured. |
| ***startPreambleForThisPartition***It defines the first preamble associated with the Feature Combination. If the UE is provided with a number N of SSB block indexes associated with one PRACH occasion, and N<1, the first preamble in each PRACH occasion is the one having the same index as indicated by this field. If N>=1, N blocks of preambles associated with the Feature Combination are defined, each having start index + *startPreambleForThisPartition*, where n refers to SSB block index (see TS 38.213 [13], clause 8.1).s |

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| Conditional Presence | Explanation |
| *MsgAConfigCommon* | The field is optionally present, Need S, if *FeatureCombinationPreambles* is included in *RACH-ConfigCommonTwoStepRA*. Otherwise, it is absent. If the field is absent in *FeatureCombinationPreambles* included in *RACH-ConfigCommonTwoStepRA*, the UE applies *MsgA-PUSCH-Config* included in the corresponding *MsgA-ConfigCommon*. |
| *Msg1Rep2* | The field is mandatory present, Need R, if msg1-Repetitions is included in FeatureCombination for this concerned FeatureCombinationPreambles. Otherwise, it is absent. |
| *Msg1Rep3* | The field is optionally present, Need S, if msg1-Repetitions is included in FeatureCombination for this concerned FeatureCombinationPreambles. Otherwise, it is absent. |

#### – *SI-RequestConfig*

The IE *SI-RequestConfig* contains configuration for Msg1 based SI request. For the random access parameters (e.g. *prach-RootSequenceIndex*, *msg1-SubcarrierSpacing*, etc.) not configured in *SI-RequestConfig*, the UE applies the parameters configured in *rach-ConfigCommon* corresponding to the RACH resource set selected upon RACH initialization (as specified in TS 38.321 [3]), of the initial uplink BWP unless otherwise specified.

*SI-RequestConfig* information element

-- ASN1START

-- TAG-SI-REQUESTCONFIG-START

SI-RequestConfig ::= SEQUENCE {

 rach-OccasionsSI SEQUENCE {

 rach-ConfigSI RACH-ConfigGeneric,

 ssb-perRACH-Occasion ENUMERATED {oneEighth, oneFourth, oneHalf, one, two, four, eight, sixteen}

 } OPTIONAL, -- Need R

 si-RequestPeriod ENUMERATED {one, two, four, six, eight, ten, twelve, sixteen} OPTIONAL, -- Need R

 si-RequestResources SEQUENCE (SIZE (1..maxSI-Message)) OF SI-RequestResources

}

SI-RequestResources ::= SEQUENCE {

 ra-PreambleStartIndex INTEGER (0..63),

 ra-AssociationPeriodIndex INTEGER (0..15) OPTIONAL, -- Need R

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

}

-- TAG-SI-REQUESTCONFIG-STOP

-- ASN1STOP

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| *SI-RequestConfig* field descriptions |
| ***rach-OccasionsSI***Configuration of dedicated RACH Occasions for SI. If the field is absent, the UE uses the corresponding parameters configured in *rach-ConfigCommon* corresponding to the RACH resource set selected upon RACH initialization (as specified in TS 38.321 [3]), of the initial uplink BWP. |
| ***si-RequestPeriod***Periodicity of the *SI-Request* configuration in number of association periods. |
| ***si-RequestResources***If there is only one entry in the list, the configuration is used for all SI messages for which *si-BroadcastStatus* or *posSI-BroadcastStatus* is set to *notBroadcasting*. Otherwise:- If *si-SchedulingInfo-v1700* is not present and the *SI-RequestConfig* is used for on-demand SI request in *SI-SchedulingInfo* or *PosSI-SchedulingInfo*, the 1st entry in the list corresponds to the first SI message in *schedulingInfoList* or *posSchedulingInfoList* for which *si-BroadcastStatus* or *posSI-BroadcastStatus* is set to *notBroadcasting*, 2nd entry in the list corresponds to the second SI message in *schedulingInfoList* or *posSchedulingInfoList* for which *si-BroadcastStatus* or *posSI-BroadcastStatus* is set to *notBroadcasting* and so on.- If *si-SchedulingInfo-v1700* is present and *SI-RequestConfig* is configured in *SI-SchedulingInfo* for on-demand SI request, the UE generates a list of concatenated SI messages by appending the SI messages containing type1 SIB configured by *schedulingInfoList2* in *si-SchedulingInfo-v1700* to the SI messagesconfigured by *schedulingInfoList* in *si-SchedulingInfo.* The 1st entry in the list corresponds to the first SI message for which *si-BroadcastStatus* is set to *notBroadcasting*, 2nd entry in the list corresponds to the second SI messagefor which *si-BroadcastStatus* is set to *notBroadcasting* and so on.- If *si-SchedulingInfo-v1700* is present and *SI-RequestConfig* is configured in *PosSI-SchedulingInfo* for on-demand SI request, the UE generates a list of concatenated SI messages by appending the SI messages containing type2 SIB configured by *schedulingInfoList2* in *si-SchedulingInfo-v1700* to the SI messagesconfigured by *posSchedulingInfoList* in *posSI-SchedulingInfo.* The 1st entry in the list corresponds to the first SI message for which *posSI-BroadcastStatus* or *si-BroadcastStatus* is set to *notBroadcasting*, 2nd entry in the list corresponds to the second SI messagefor which *posSI-BroadcastStatus* or *si-BroadcastStatus* is set to *notBroadcasting* and so on.Change of *si-RequestResources* should not result in system information change notification. |

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| *SI-RequestResources* field descriptions |
| ***ra-AssociationPeriodIndex***Index of the association period in the *si-RequestPeriod* in which the UE can send the SI request for SI message(s) corresponding to this *SI-RequestResources*, using the preambles indicated by *ra-PreambleStartIndex* and rach occasions indicated by *ra-ssb-OccasionMaskIndex*. |
| ***ra-PreambleStartIndex***If N SSBs are associated with a RACH occasion, where N > = 1, for the i-th SSB (i=0, …, N-1) the preamble with preamble index = *ra-PreambleStartIndex* + i is used for SI request; For N < 1, the preamble with preamble index = *ra-PreambleStartIndex* is used for SI request. |

***End of change***