**3GPP TSG-RAN2 Meeting #124 *R2-2313589***

**Chicago, USA, Nov 13th - 17th 2023**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.331** | **CR** | **4502** | **rev** | **-** | **Current version:** | **17.6.0** |  |
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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 NCD-SSB time offset for RedCap UEs in TDD |
|  |  |
| ***Source to WG:*** | Ericsson, Qualcomm Incorporated, ZTE Corporation, Sanechips |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_redcap-Core |  | ***Date:*** | 2023-12-01 |
|  |  |  |  |  |
| ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In RAN2#123bis, RAN2 has received an LS from RAN1 (R2-2311712) on NCD-SSB time offset for RedCap UEs in TDD. RAN1 has made the following agreement:“For RedCap UE in TDD, the NW ensures that the NCD-SSB time domain location is a subset of the time domain location of CD-SSB”In TS 38.331, the following description is captured for parameter *ssb-TimeOffset*:***ssb-TimeOffset***The time offset between CD-SSB of the serving cell and this NCD-SSB. Value *ms5* means the first burst of NCD-SSB is transmitted 5ms later than the first burst of CD-SSB transmitted after the first symbol of SFN=0 of the serving cell, value *ms10* means the first burst of NCD-SSB is transmitted 10ms later than the first burst of CD-SSB transmitted after the first symbol in SFN=0 of the serving cell, and so on. If the field is absent, RedCap UE considers that the time offset between the first burst of CD-SSB transmitted in the serving cell and the first burst of this NCD-SSB transmitted is zero.According to the latest RAN1 agreement, for TDD cells, either the network does not configure *ssb-TimeOffset* for NCD-SSB (means 0ms time offset is applied), or network configures *ssb-TimeOffset* to ensure NCD-SSB time domain location is a subset of the time domain location of CD-SSB. The allowed/disallowed values are summarized in the table below:

|  |  |
| --- | --- |
| Periodicity of CD-SSB (ms) | ssb-TimeOffset (ms) |
| Allowed values | Disallowed values |
| 5 | 5, 10, 15, 20, 40, 80 | - |
| 10 | 10, 20, 40, 80 | 5, 15 |
| 20 | 20, 40, 80 | 5, 10, 15 |
| 40 | 40, 80 | 5, 10, 15, 20 |
| 80 | 80 | 5, 10, 15, 20, 40 |
| 160 | ssb-TimeOffset cannot be configured.  |

Based on the LS from RAN1, mentioned above, it needs to be captured in the spec that for RedCap UEs in TDD, the time offset needs to be restricted so that NCD-SSB coincides with CD-SSB, i.e., NCD-SSB time offset has to be a multiple of CD-SSB periodicity. |
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| ***Summary of change:*** | The following statement is captured in the field description of *ssb-TimeOffset*: “For RedCap UEs in TDD cells, the network configures this time offset to be an integer multiple of the periodicity of the serving cell’s CD-SSB” **Impact analysis**Impacted 5G architecture options:NR StandaloneImpacted functionality:NonCellDefiningSSBInter-operability: If the UE is implemented according to this CR while the network is not, a RedCap UE in TDD may receive a configuration which the UE does not consider as valid. If the network is implemented according to this CR while the UE is not, there are no interoperability issues. |
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| ***Consequences if not approved:*** | For RedCap UE in TDD, NW may provide a configuration for NCD-SSB time domain location that is not a subset of the time domain location of CD-SSB, i.e., not an integer multiple of the periodicity of the serving cell’s CD-SSB. This may lead to interoperability issues since UE behaviour is not specified in case network configures NCD-SSB time domain location not as a subset of the time domain location of CD-SSB. |
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| ***Clauses affected:*** | 6.3.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

6.3.2 Radio resource control information elements

– *AdditionalSpectrumEmission*

The IEs *AdditionalSpectrumEmission* and *AdditionalSpectrumEmission-v1760* are used to indicate emission requirements to be fulfilled by the UE (see TS 38.101-1 [15], clause 6.2.3/6.2A.3, TS 38.101-2 [39], clause 6.2.3/6.2A.3, and TS 38.101-5 [75], clause 6.2.3). If an extension is signalled using the extended value range (as defined by the IE *AdditionalSpectrumEmission-v1760)*, the corresponding original field, using the value range as defined by the IE *AdditionalSpectrumEmission* (without suffix) shall be set to value 7.

***AdditionalSpectrumEmission* information element**

-- ASN1START

-- TAG-ADDITIONALSPECTRUMEMISSION-START

AdditionalSpectrumEmission ::= INTEGER (0..7)

AdditionalSpectrumEmission-v1760 ::= INTEGER (8..39)

-- TAG-ADDITIONALSPECTRUMEMISSION-STOP

-- ASN1STOP

– *Alpha*

The IE *Alpha* defines possible values of a the pathloss compensation coefficient for uplink power control. Value *alpha0* corresponds to the value 0, Value *alpha04* corresponds to the value 0.4, Value *alpha05* corresponds to the value 0.5 and so on. Value *alpha1* corresponds to value 1. See also clause 7.1 of TS 38.213 [13].

-- ASN1START

-- TAG-ALPHA-START

Alpha ::= ENUMERATED {alpha0, alpha04, alpha05, alpha06, alpha07, alpha08, alpha09, alpha1}

-- TAG-ALPHA-STOP

-- ASN1STOP

– *AMF-Identifier*

The IE *AMF-Identifier* (AMFI) comprises of an AMF Region ID, an AMF Set ID and an AMF Pointer as specified in TS 23.003 [21], clause 2.10.1.

***AMF-Identifier* information element**

-- ASN1START

-- TAG-AMF-IDENTIFIER-START

AMF-Identifier ::= BIT STRING (SIZE (24))

-- TAG-AMF-IDENTIFIER-STOP

-- ASN1STOP

**<cut>**

– *NonCellDefiningSSB*

The IE *NonCellDefiningSSB* is used to configure a NCD-SSB to be used while the UE operates in a RedCap-specific initial BWP or dedicated BWP.

***NonCellDefiningSSB* information element**

-- ASN1START

-- TAG-NONCELLDEFININGSSB-START

NonCellDefiningSSB-r17 ::= SEQUENCE {

 absoluteFrequencySSB-r17 ARFCN-ValueNR,

 ssb-Periodicity-r17 ENUMERATED { ms5, ms10, ms20, ms40, ms80, ms160, spare2, spare1 } OPTIONAL, -- Need S

 ssb-TimeOffset-r17 ENUMERATED { ms5, ms10, ms15, ms20, ms40, ms80, spare2, spare1 } OPTIONAL, -- Need S

 ...

}

-- TAG-NONCELLDEFININGSSB-STOP

-- ASN1STOP

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| ***NonCellDefiningSSB* field descriptions** |
| ***absoluteFrequencySSB***Frequency of the NCD-SSB. The network configures this field so that the SSB is within the bandwidth of the BWP configured in *BWP-DownlinkCommon*. |
| ***ssb-Periodicity***The periodicity of this NCD-SSB. The network configures only periodicities that are larger than the periodicity of serving cell's CD-SSB. If the field is absent, the UE applies the SSB periodicity of the CD-SSB (*ssb-periodicityServingCell* configured in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*). |
| ***ssb-TimeOffset***The time offset between CD-SSB of the serving cell and this NCD-SSB. Value *ms5* means the first burst of NCD-SSB is transmitted 5ms later than the first burst of CD-SSB transmitted after the first symbol of SFN=0 of the serving cell, value *ms10* means the first burst of NCD-SSB is transmitted 10ms later than the first burst of CD-SSB transmitted after the first symbol in SFN=0 of the serving cell, and so on. If the field is absent, RedCap UE considers that the time offset between the first burst of CD-SSB transmitted in the serving cell and the first burst of this NCD-SSB transmitted is zero. For RedCap UEs in TDD cells, the network configures this time offset to be an integer multiple of the periodicity of the serving cell’s CD-SSB. |

– *NPN-Identity*

The IE *NPN-Identity* includes either a list of CAG-IDs or a list of NIDs per PLMN Identity. Further information regarding how to set the IE is specified in TS 23.003 [21].

***NPN-Identity* information element**

-- ASN1START

-- TAG-NPN-IDENTITY-START

NPN-Identity-r16 ::= CHOICE {

 pni-npn-r16 SEQUENCE {

 plmn-Identity-r16 PLMN-Identity,

 cag-IdentityList-r16 SEQUENCE (SIZE (1..maxNPN-r16)) OF CAG-IdentityInfo-r16

 },

 snpn-r16 SEQUENCE {

 plmn-Identity-r16 PLMN-Identity,

 nid-List-r16 SEQUENCE (SIZE (1..maxNPN-r16)) OF NID-r16

 }

}

CAG-IdentityInfo-r16 ::= SEQUENCE {

 cag-Identity-r16 BIT STRING (SIZE (32)),

 manualCAGselectionAllowed-r16 ENUMERATED {true} OPTIONAL -- Need R

}

NID-r16 ::= BIT STRING (SIZE (44))

-- TAG-NPN-IDENTITY-STOP

-- ASN1STOP

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| ***NPN-Identity* field descriptions** |
| ***cag-Identity***A CAG-ID as specified in TS 23.003 [21]. The PLMN ID and a CAG ID in the *NPN-Identity* identifies a PNI-NPN. |
| ***cag-IdentityList***The *cag-IdentityList* contains one or more CAG IDs. All CAG IDs associated to the same PLMN ID are listed in the same *cag-IdentityList* entry*.* |
| ***manualCAGselectionAllowed***The *manualCAGselectionAllowed* indicates that the CAG ID can be selected manually even if it is outside the UE's allowed CAG list. |
| ***NID***A NID as specified in TS 23.003 [21]. The PLMN ID and a NID in the *NPN-Identity* identifies a SNPN. |
| ***nid-List***The *nid-List* contains one or more *NID*. |

– *NPN-IdentityInfoList*

The IE *NPN-IdentityInfoList* includes a list of NPN identity information.

***NPN-IdentityInfoList* information element**

-- ASN1START

-- TAG-NPN-IDENTITYINFOLIST-START

NPN-IdentityInfoList-r16 ::= SEQUENCE (SIZE (1..maxNPN-r16)) OF NPN-IdentityInfo-r16

NPN-IdentityInfo-r16 ::= SEQUENCE {

 npn-IdentityList-r16 SEQUENCE (SIZE (1..maxNPN-r16)) OF NPN-Identity-r16,

 trackingAreaCode-r16 TrackingAreaCode,

 ranac-r16 RAN-AreaCode OPTIONAL, -- Need R

 cellIdentity-r16 CellIdentity,

 cellReservedForOperatorUse-r16 ENUMERATED {reserved, notReserved},

 iab-Support-r16 ENUMERATED {true} OPTIONAL, -- Need S

 ...,

 [[

 gNB-ID-Length-r17 INTEGER (22..32) OPTIONAL -- Need R

 ]]

}

-- TAG-NPN-IDENTITYINFOLIST-STOP

-- ASN1STOP

**<cut>**

End of changes