**3GPP TSG-RAN2#121R2-230xxxx**

**Athens, 27th Feb – 4th March 2023**

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| --- |
| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **36.331** | **CR** | **4917** | **rev** | **1** | **Current version:** | **17.3.0** |  |
|  |
| *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:***  | Addition of extended NS value range |
|  |  |
| ***Source to WG:*** | Apple Inc |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_unlic\_enh |  | ***Date:*** | 27/02/2023 |
|  |  |  |  |  |
| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | RAN4 agreements to support extended NS value range for unlicensed (and potentially licensed) bands. RAN LS R4-2214953 initiated the discussion on extending the range, and in LS R4-2220493, RAN4 confirmed that the introduction of this is preferred from Rel-16. |
|  |  |
| ***Summary of change:*** | 1. Add signalling in SIB24 to allow the NW to configure the UE with additional NS values for each bands that are being used.
2. Add description to the newly added IEs.

**Impact analysis**Impacted 5G architecture options:SAImpacted functionality:RRC configuration for UE UL requirementsInter-operability: * If the network is implemented according to the CR and the UE is not, there is no interoperability issue.
* If the UE is implemented according to the CR and the network is not, there is no interoperability issue.
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|  |  |
| ***Consequences if not approved:*** | New NS value range cannot be used as RAN4 intended. |
|  |  |
| ***Clauses affected:*** | 6.3.1, 6.3.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **Y** |  |  Other core specifications  | TS/TR 38.331... CR ..3900.  |
| ***affected:*** |  | **X** |   Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

|  |
| --- |
| First change |

### 6.3.1 System information blocks

#### – *SystemInformationBlockPos*

The IE *SystemInformationBlockPos* contains positioning assistance data as defined in TS 36.355 [54].

*SystemInformationBlockPos* information element

-- ASN1START

SystemInformationBlockPos-r15 ::= SEQUENCE {

 assistanceDataSIB-Element-r15 OCTET STRING,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 ...

}

-- ASN1STOP

| *SystemInformationBlockPos* field descriptions |
| --- |
| ***assistanceDataSIB-Element***Parameter *AssistanceDataSIBelement* defined in TS 36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit. |

**<<irrelevant parts skipped>>**

#### – *SystemInformationBlockType24*

The IE *SystemInformationBlockType24* contains information relevant for inter-RAT cell re-selection (i.e. information about NR frequencies and NR neighbouring cells relevant for cell re-selection), which can also be used for NR idle/inactive measurements. The IE includes cell re-selection parameters common for a frequency.

*SystemInformationBlockType24* information element

-- ASN1START

SystemInformationBlockType24-r15 ::= SEQUENCE {

 carrierFreqListNR-r15 CarrierFreqListNR-r15 OPTIONAL, -- Need OR

 t-ReselectionNR-r15 T-Reselection,

 t-ReselectionNR-SF-r15 SpeedStateScaleFactors OPTIONAL, -- Need OR

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 ...,

 [[ carrierFreqListNR-v1610 CarrierFreqListNR-v1610 OPTIONAL -- Need OR

 ]],

 [[ carrierFreqListNR-v1700 CarrierFreqListNR-v1700 OPTIONAL -- Need OR

 ]],

 [[ carrierFreqListNR-v1720 CarrierFreqListNR-v1720 OPTIONAL -- Need OR

 ]]

}

CarrierFreqListNR-r15 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-r15

CarrierFreqListNR-v1610 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1610

CarrierFreqListNR-v1700 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1700

CarrierFreqListNR-v1720 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1720

CarrierFreqNR-r15 ::= SEQUENCE {

 carrierFreq-r15 ARFCN-ValueNR-r15,

 multiBandInfoList-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR

 multiBandInfoListSUL-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR

 measTimingConfig-r15 MTC-SSB-NR-r15 OPTIONAL, -- Need OR

 subcarrierSpacingSSB-r15 ENUMERATED {kHz15, kHz30, kHz120, kHz240},

 ss-RSSI-Measurement-r15 SS-RSSI-Measurement-r15 OPTIONAL, -- Cond RSRQ2

 cellReselectionPriority-r15 CellReselectionPriority OPTIONAL, -- Need OP

 cellReselectionSubPriority-r15 CellReselectionSubPriority-r13 OPTIONAL, -- Need OR

 threshX-High-r15 ReselectionThreshold,

 threshX-Low-r15 ReselectionThreshold,

 threshX-Q-r15 SEQUENCE {

 threshX-HighQ-r15 ReselectionThresholdQ-r9,

 threshX-LowQ-r15 ReselectionThresholdQ-r9

 } OPTIONAL, -- Cond RSRQ

 q-RxLevMin-r15 INTEGER (-70..-22),

 q-RxLevMinSUL-r15 INTEGER (-70..-22) OPTIONAL, -- Need OR

 p-MaxNR-r15 P-MaxNR-r15,

 ns-PmaxListNR-r15 NS-PmaxListNR-r15 OPTIONAL, -- Need OR

 q-QualMin-r15 INTEGER (-43..-12) OPTIONAL, -- Need OP

 deriveSSB-IndexFromCell-r15 BOOLEAN,

 maxRS-IndexCellQual-r15 MaxRS-IndexCellQualNR-r15 OPTIONAL, -- Need OR

 threshRS-Index-r15 ThresholdListNR-r15 OPTIONAL, -- Need OR

 ...,

 [[ multiBandNsPmaxListNR-v1550 MultiBandNsPmaxListNR-1-v1550 OPTIONAL, -- Need OR

 multiBandNsPmaxListNR-SUL-v1550 MultiBandNsPmaxListNR-v1550 OPTIONAL, -- Need OR

 ssb-ToMeasure-r15 SSB-ToMeasure-r15 OPTIONAL -- Need OR

 ]],

 [[ multiBandNsExtListNR-v17xy MultiBandNsExtListNR-v17xy OPTIONAL, -- Need OR

 ]]

}

CarrierFreqNR-v1610 ::= SEQUENCE {

 smtc2-LP-r16 MTC-SSB2-LP-NR-r16 OPTIONAL, -- Need OR

 ssb-PositionQCL-CommonNR-r16 SSB-PositionQCL-RelationNR-r16 OPTIONAL, -- Cond SharedSpectrum2

 allowedCellListNR-r16 AllowedCellListNR-r16 OPTIONAL, -- Cond SharedSpectrum

 highSpeedCarrierNR-r16 ENUMERATED {true} OPTIONAL -- Need OR

}

CarrierFreqNR-v1700 ::= SEQUENCE {

 nr-FreqNeighHSDN-CellList-r17 NR-FreqNeighHSDN-CellList-r17 OPTIONAL -- Need OR

}

CarrierFreqNR-v1720 ::= SEQUENCE {

 subcarrierSpacingSSB-r17 ENUMERATED {kHz480, spare1} OPTIONAL, -- Need OR

 ssb-PositionQCL-CommonNR-r17 SSB-PositionQCL-RelationNR-r17 OPTIONAL -- Cond SharedSpectrum2

}

MultiBandNsPmaxListNR-1-v1550 ::= SEQUENCE (SIZE (1.. maxMultiBandsNR-1-r15)) OF NS-PmaxListNR-r15

MultiBandNsPmaxListNR-v1550 ::= SEQUENCE (SIZE (1.. maxMultiBandsNR-r15)) OF NS-PmaxListNR-r15

MultiBandNsExtListNR-v17xy ::= SEQUENCE (SIZE (1.. maxMultiBandsNR-r15)) OF NS-ExtListNR-v17xy

AllowedCellListNR-r16 ::= SEQUENCE (SIZE (1..maxCellAllowedNR-r16)) OF PhysCellIdNR-r15

NR-FreqNeighHSDN-CellList-r17 ::= SEQUENCE (SIZE (1..maxCellNR-r17)) OF PhysCellIdRangeNR-r16

-- ASN1STOP

| *SystemInformationBlockType24* field descriptions |
| --- |
| ***allowedCellListNR***List of allow-listed neighbouring NR cells. |
| ***carrierFreqListNR***List of carrier frequencies of NR carriers. These frequencies correspond to GSCN values as specified in TS 38.101 [85]. If the *carrierFreqListNR-v1610* is present, it contains the same number of entries, listed in the same order as in the *carrierFreqListNR* (without suffix). |
| ***cellReselectionPriority***The field concerns the absolute priority of the concerned carrier frequency as used by the cell reselection procedure. Corresponds with parameter "priority" in TS 36.304 [4]. |
| ***deriveSSB-IndexFromCell***The field indicates whether the UE may use, to derive the SSB index of a cell on the indicated SSB frequency and subcarrier spacing, the timing of any detected cell with the same SSB frequency and subcarrier spacing. If this field is set to TRUE, the UE assumes SFN and frame boundary alignment across cells on the same NR carrier frequency as specified in TS 36.133 [16]. |
| ***highSpeedCarrierNR***If the field is present, the UE shall apply the enhanced inter-RAT NR measurement requirements to support high speed up to 500 km/h as specified in TS 36.133 [16] to the NR carrier. |
| ***maxRS-IndexCellQual***Number of SS blocks to average for cell measurement derivation. Corresponds to the parameter *nrofSS-BlocksToAverage* in TS 38.304 [92]. |
| ***measTimingConfig***Used to configure measurement timing configurations, i.e., timing occasions at which the UE measures SSBs. If the field is absent, the UE assumes that SSB periodicity is 5ms in this frequency. |
| ***multiBandInfoList***Indicates the list of frequency bands for which the NR cell reselection parameters apply. The UE shall select the first listed band which it supports in the *multiBandInfoList* field to represent the NR neighbour carrier frequency. The network always includes this field. |
| ***multiBandInfoListSUL***Indicates the list of frequency bands for which the NR cell reselection parameters apply. The UE shall select the first listed band which it supports in the *multiBandInfoListSUL* field to represent the NR neighbour carrier frequency. |
| ***multiBandNsPmaxListNR***Indicates the *NS-PmaxListNR* configuration for the NR frequency band(s) listed in *multiBandInfoList*. The first entry corresponds to the second listed band in *multiBandInfoList*, and second entry corresponds to the third listed band in *multiBandInfoList*, and so on.  |
| ***multiBandNsPmaxListNR-SUL***Indicates the *NS-PmaxListNR* configuration for the NR SUL frequency band(s) listed in *multiBandInfoListSUL*. The first entry corresponds to the first listed band in *multiBandInfoListSUL*, and second entry corresponds to the second listed band in *multiBandInfoListSUL*, and so on. |
| ***nr-FreqNeighHSDN-CellList***List of neighbouring NR HSDN cells as specified in TS 38.304 [92]. |
| ***ns-PmaxListNR***Indicates a list of *additionalPmax* and *additionalSpectrumEmission*, corresponds to the first listed band in the *multiBandInfoList*. |
| ***p-MaxNR***Indicates the maximum power for NR (see TS 38.104 [91]). |
| ***q-QualMin***Parameter "Qqualmin" in TS 36.304 [4], applicable for NR neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin. The actual value Qqualmin = field value [dB]. |
| ***q-RxLevMin***Parameter "Qrxlevmin" in TS 38.304 [92], applicable for NR neighbour cells. The actual value Qrxlevmin = field value \* 2 [dBm]. |
| ***q-RxLevMinSUL***Parameter "Qrxlevmin" in TS 38.304 [92], applicable for NR neighbouring cells. The actual value Qrxlevmin = field value \* 2 [dBm]. |
| ***smtc2-LP***Measurement timing configuration for inter-RAT neighbour cells in NR with a Long Periodicity (LP) indicated by periodicity in *smtc2-LP*. The timing offset and duration are equal to the offset and duration indicated in *measTimingConfig* in *CarrierFreqNR*. The periodicity in *smtc2-LP* can only be set to a value strictly larger than the periodicity in *measTimingConfig* in *CarrierFreqNR* (e.g. if *measTimingConfig* indicates sf20 the Long Periodicity can only be set to sf40, sf80 or sf160, if *measTimingConfig* indicates sf160, *smtc2-LP* cannot be configured). The *pci-List*, if present, includes the physical cell identities of the inter-RAT neighbour cells with Long Periodicity. If *smtc2-LP* is absent, the UE assumes that there are no inter-RAT neighbour cells with a Long Periodicity. |
| ***ssb-PositionQCL-CommonNR***Indicates the QCL relationship between SS/PBCH blocks for NR neighbor cells on the indicated frequency as specified in TS 38.213 [88], clause 4.1. If *ssb-PositionQCL-CommonNR-r17* is present, the UE ignores *ssb-PositionQCL-CommonNR-r16*. |
| ***ssb-ToMeasure***The set of SS blocks to be measured within the SMTC measurement duration (see TS 38.215 [89]). When the field is absent the UE measures on all SS-blocks. |
| ***ss-RSSI-Measurements***Indicates the SSB-based RSSI measurement configuration. If the field is absent, the UE behaviour is defined in TS 38.215 [89], clause 5.1.3. |
| ***subcarrierSpacingSSB***Indicates the subcarrier spacing of SSB of NR frequency. Only the values 15 kHz or 30 kHz (FR1), 120 kHz or 240 kHz (FR2-1), 120 kHz or 480 kHz (FR2-2) are applicable. If *subcarrierSpacingSSB-r17* is present, the UE ignores *subcarrierSpacingSSB-r15*. |
| ***threshRS-Index***List of thresholds for consolidation of L1 measurements per RS index. Corresponds to the parameter *absThreshSS-BlocksConsolidation* in TS 38.304 [92]. |
| ***threshX-High***Parameter "ThreshX, HighP" in TS 36.304 [4]. |
| ***threshX-HighQ***Parameter "ThreshX, HighQ" in TS 36.304 [4]. |
| ***threshX-Low***Parameter "ThreshX, LowP" in TS 36.304 [4]. |
| ***threshX-LowQ***Parameter "ThreshX, LowQ" in TS 36.304 [4]. |
| ***t-ReselectionNR***Parameter "TreselectionNR" in TS 36.304 [4]. |
| ***t-ReselectionNR-SF***Parameter "Speed dependent ScalingFactor for TreselectionNR" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4]. |

| Conditional presence | Explanation |
| --- | --- |
| *RSRQ* | The field is mandatory present if the *threshServingLowQ* is present in *systemInformationBlockType3*; otherwise it is not present. |
| *RSRQ2* | The field is optional Need OP if the *threshServingLowQ* is present in *systemInformationBlockType3*; otherwise it is not present. |
| *SharedSpectrum* | The field is optional Need OP if NR operates with shared spectrum channel access; otherwise, it is not present. |
| *SharedSpectrum2* | The field is mandatory present if NR operates with shared spectrum channel access; otherwise, it is not present. |

### 6.3.4 Mobility control information elements

#### – *AdditionalSpectrumEmission*

If an extension is signalled using the extended value range (as defined by IE *AdditionalSpectrumEmission-v10l0*), the corresponding original field, using the value range as defined by IE *AdditionalSpectrumEmission* i.e. without suffix) shall be set to value 32, if signalled. UE supporting an LTE band assigned NS values larger than 32 as defined in TS 36.101 [42], clause 6.2.4, needs to support extension signaling (as defined by IE *AdditionalSpectrumEmission-v10l0*).

*AdditionalSpectrumEmission* information element

-- ASN1START

AdditionalSpectrumEmission ::= INTEGER (1..32)

AdditionalSpectrumEmission-v10l0 ::= INTEGER (33..288)

-- ASN1STOP

#### – *AdditionalSpectrumEmissionNR*

The IE *AdditionalSpectrumEmissionNR* is used to indicate NR emission requirements to be fulfilled by the UE (see TS 38.101-1 [85], clause 6.5.3.3, and TS 38.101-2 [100], clause 6.5.3.2 and TS 38.101-3 [101], clause 6.5B.2)

*AdditionalSpectrumEmissionNR* information element

-- ASN1START

AdditionalSpectrumEmissionNR-r15 ::= INTEGER (0..7)

AdditionalSpectrumEmissionNR-v16b0 ::= INTEGER (8..39)

-- ASN1STOP

**<<irrelevant parts skipped>>**

#### – *MultiFrequencyBandListNR*

The IE MultiFrequencyBandListNR is used to configure a list of one or multiple NR frequency bands.

*MultiFrequencyBandListNR information element*

-- ASN1START

MultiFrequencyBandListNR-r15 ::= SEQUENCE (SIZE (1.. maxMultiBandsNR-r15)) OF FreqBandIndicatorNR-r15

-- ASN1STOP

#### – *NS-PmaxList*

The IE *NS-PmaxList* concerns a list of *additionalPmax* and *additionalSpectrumEmission*, as defined in TS 36.101 [42], table 6.2.4-1, for UEs neither in CE nor BL UEs and TS 36.101 [42], table 6.2.4E-1, for UEs in CE or BL UEs, for a given frequency band. E-UTRAN does not include the same value of *additionalSpectrumEmission* in *SystemInformationBlockType2* within this list.

*NS-PmaxList* information element

-- ASN1START

NS-PmaxList-r10 ::= SEQUENCE (SIZE (1..maxNS-Pmax-r10)) OF NS-PmaxValue-r10

NS-PmaxList-v10l0 ::= SEQUENCE (SIZE (1..maxNS-Pmax-r10)) OF NS-PmaxValue-v10l0

NS-PmaxValue-r10 ::= SEQUENCE {

 additionalPmax-r10 P-Max OPTIONAL, -- Need OP

 additionalSpectrumEmission AdditionalSpectrumEmission

}

NS-PmaxValue-v10l0 ::= SEQUENCE {

 additionalSpectrumEmission-v10l0 AdditionalSpectrumEmission-v10l0 OPTIONAL -- Need OP

}

-- ASN1STOP

#### *– NS-PmaxListNR*

The IE *NS-PmaxListNR* concerns a list of *additionalPmax* and *additionalSpectrumEmission*, as defined in TS 38.101 [85], table 6.2.3-1 for a given frequency band.

*NS-PmaxListNR* information element

-- ASN1START

NS-PmaxListNR-r15 ::= SEQUENCE (SIZE (1..8)) OF NS-PmaxValueNR-r15

NS-PmaxValueNR-r15 ::= SEQUENCE {

 additionalPmaxNR-r15 P-MaxNR-r15 OPTIONAL, -- Need ON

 additionalSpectrumEmissionNR-r15 AdditionalSpectrumEmissionNR-r15

}

NS-ExtListNR-v17xy ::= SEQUENCE (SIZE (1..32)) OF NR-NS-ExtendedValue-v17xy

NR-NS-ExtendedValue-v17xy ::= SEQUENCE {

 additionalSpectrumEmission-v16b0 AdditionalSpectrumEmission-v17xy OPTIONAL, -- Need N

}

-- ASN1STOP