**3GPP TSG-RAN WG2 Meeting #117 Electronic *R2-220XXXX***

**Elbonia, 21 February – 03 March 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.331** | **CR** | **2933** | **rev** | **1** | **Current version:** | **16.7.0** |  |
|  |
| *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:***  | HST on FR2 |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_HST\_FR2 |  | ***Date:*** | 2022-02-14 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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)* |
|  |  |
| ***Reason for change:*** | RAN4 has indicated in R2-2202167 that for NR\_HST\_FR2 that they have agreed to introduce:1. 2 sets of enhanced RRM requirements on speeds up to 350km/h. The per cell signaling is provided to UE in both IDLE and CONNECTED
2. network assistance to inform UE on the FR2 HST deployment type (uni-directional or bi-directional), and
3. network signaling flag to enable/disable large one step UE autonomous uplink transmit timing adjustment.
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| ***Summary of change:*** | 1. *highSpeedMeasFlagFR2* indicates whether requirement set 1 or two is used for FR HST up to 350km/h
2. *highSpeedDeploymentTypeFR2* indicates FR2 deployment type for FR HST up to 350km/h
3. *highSpeedLargeOneStepUL-timingFR2* indicates whether large one step UE autonomous UL transmit timing adjustment is enabled
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| ***Consequences if not approved:*** | RRM enhancements for Rel-17 NR FR2 HST is not supported by RRC. |
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| ***Clauses affected:*** |  6.3.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS38.306 CR692  |
| ***affected:*** |  | **X** |  Test specifications | TS38.133. CR ... TS38.101 CR … |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*First Modified Subclause*

### 6.3.2 Radio resource control information elements

----------------------------------------OMITTED SECTIONS--------------------------------------------------------------------

– *HighSpeedConfig*

The IE *HighSpeedConfig* is used to configure parameters for high speed scenarios.

***HighSpeedConfig* information element**

-- ASN1START

-- TAG-HIGHSPEEDCONFIG-START

HighSpeedConfig-r16 ::= SEQUENCE {

 highSpeedMeasFlag-r16 ENUMERATED {true} OPTIONAL, -- Need R

 highSpeedDemodFlag-r16 ENUMERATED {true} OPTIONAL, -- Need R

 ...

}

HighSpeedConfigFR2-r17 ::= SEQUENCE {

 highSpeedMeasFlagFR2-r17 ENUMERATED {set1, set2} OPTIONAL, -- Need R

 highSpeedDeploymentTypeFR2-r17 ENUMERATED {unidirectional, bidirectional} OPTIONAL, -- Need R

 highSpeedLargeOneStepUL-TimingFR2-r17 ENUMERATED {true} OPTIONAL, -- Need R

 ...

}

-- TAG-HIGHSPEEDCONFIG-STOP

-- ASN1STOP

| ***HighSpeedConfig* field descriptions** |
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| ***highSpeedDeploymentTypeFR2***If the field is present, and field value is *unidireactional*,the UE shall assume uni-directional deployment or if field value is *birectional* the UE shall assume bidirectional deployment for FR2 up to 350km/h as specified in TS 38.133 [14]. |
| ***highSpeedMeasFlag***If the field is present and UE supports *measurementEnhancement-r16*, the UE shall apply the enhanced intra-NR and inter-RAT EUTRAN RRM requirements to support high speed up to 500 km/h as specified in TS 38.133 [14].If the field is present and UE supports *intraNR-MeasurementEnhancement-r16*, the UE shall apply enhanced intra-NR RRM requirement to support high speed up to 500 km/h as specified in TS 38.133 [14].If the field is present and UE supports *interRAT-MeasurementEnhancement-r16*, the UE shall apply enhanced inter-RAT EUTRAN RRM requirement to support high speed up to 500 km/h as specified in TS 38.133 [14]. |
| ***highSpeedMeasFlagFR2***If the field is present, the UE shall apply enhanced intra-NR RRM requirement set one to support high speed up to 350 km/h for FR2 as specified in TS 38.133 [14], if the field value is *set1* or RRM requirement set two if the field value is *set2*. |
| ***highSpeedDemodFlag***If the field is present, the UE shall apply the enhanced demodulation processing for HST-SFN joint transmission scheme with velocity up to 500km/h as specified in TS 38.101-4 [59]. |
| ***highSpeedLargeOneSteptUL-TimingFR2***If the field is present, large one step UE autonomous uplink transmit timing adjustment for FR2 up to 350km/h as specified in TS 38.133 [14] is enabled. |

*Next Modified Subclause*

– *ServingCellConfigCommon*

The IE *ServingCellConfigCommon* is used to configure cell specific parameters of a UE's serving cell. The IE contains parameters which a UE would typically acquire from SSB, MIB or SIBs when accessing the cell from IDLE. With this IE, the network provides this information in dedicated signalling when configuring a UE with a SCells or with an additional cell group (SCG). It also provides it for SpCells (MCG and SCG) upon reconfiguration with sync.

***ServingCellConfigCommon* information element**

-- ASN1START

-- TAG-SERVINGCELLCONFIGCOMMON-START

ServingCellConfigCommon ::= SEQUENCE {

 physCellId PhysCellId OPTIONAL, -- Cond HOAndServCellAdd,

 downlinkConfigCommon DownlinkConfigCommon OPTIONAL, -- Cond HOAndServCellAdd

 uplinkConfigCommon UplinkConfigCommon OPTIONAL, -- Need M

 supplementaryUplinkConfig UplinkConfigCommon OPTIONAL, -- Need S

 n-TimingAdvanceOffset ENUMERATED { n0, n25600, n39936 } OPTIONAL, -- Need S

 ssb-PositionsInBurst CHOICE {

 shortBitmap BIT STRING (SIZE (4)),

 mediumBitmap BIT STRING (SIZE (8)),

 longBitmap BIT STRING (SIZE (64))

 } OPTIONAL, -- Cond AbsFreqSSB

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

 dmrs-TypeA-Position ENUMERATED {pos2, pos3},

 lte-CRS-ToMatchAround SetupRelease { RateMatchPatternLTE-CRS } OPTIONAL, -- Need M

 rateMatchPatternToAddModList SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPattern OPTIONAL, -- Need N

 rateMatchPatternToReleaseList SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPatternId OPTIONAL, -- Need N

 ssbSubcarrierSpacing SubcarrierSpacing OPTIONAL, -- Cond HOAndServCellWithSSB

 tdd-UL-DL-ConfigurationCommon TDD-UL-DL-ConfigCommon OPTIONAL, -- Cond TDD

 ss-PBCH-BlockPower INTEGER (-60..50),

 ...,

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 channelAccessMode-r16 CHOICE {

 dynamic NULL,

 semiStatic SemiStaticChannelAccessConfig-r16

 } OPTIONAL, -- Cond SharedSpectrum

 discoveryBurstWindowLength-r16 ENUMERATED {ms0dot5, ms1, ms2, ms3, ms4, ms5} OPTIONAL, -- Need R

 ssb-PositionQCL-r16 SSB-PositionQCL-Relation-r16 OPTIONAL, -- Cond SharedSpectrum

 highSpeedConfig-r16 HighSpeedConfig-r16 OPTIONAL -- Need R

 ]],

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 highSpeedConfigFR2-r17 HighSpeedConfigFR2-r17 OPTIONAL -- Need R

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}

-- TAG-SERVINGCELLCONFIGCOMMON-STOP

-- ASN1STOP

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| ***ServingCellConfigCommon* field descriptions** |
| ***channelAccessMode***If present, this field indicates which channel access procedures to apply for operation with shared spectrum channel access as defined in TS 37.213 [48]. If the field is configured as "semiStatic", the UE shall apply the channel access procedures for semi-static channel occupancy as described in subclause 4.3 in TS 37.213. If the field is configured as "dynamic", the UE shall apply the channel access procedures in TS 37.213, with the exception of subclause 4.3 of TS 37.213. |
| ***dmrs-TypeA-Position***Position of (first) DM-RS for downlink (see TS 38.211 [16], clause 7.4.1.1.1) and uplink (TS 38.211 [16], clause 6.4.1.1.3). |
| ***downlinkConfigCommon***The common downlink configuration of the serving cell, including the frequency information configuration and the initial downlink BWP common configuration. The parameters provided herein should match the parameters configured by MIB and SIB1 (if provided) of the serving cell, with the exception of *controlResourceSetZero* and *searchSpaceZero* which can be configured in *ServingCellConfigCommon* even if MIB indicates that they are absent. |
| ***discoveryBurstWindowLength***Indicates the window length of the discovery burst in ms (see TS 37.213 [48]). |
| ***longBitmap***Bitmap when maximum number of SS/PBCH blocks per half frame equals to 64 as defined in TS 38.213 [13], clause 4.1. |
| ***lte-CRS-ToMatchAround***Parameters to determine an LTE CRS pattern that the UE shall rate match around. |
| ***mediumBitmap***Bitmap when maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [13], clause 4.1. |
| ***n-TimingAdvanceOffset***The N\_TA-Offset to be applied for all uplink transmissions on this serving cell. If the field is absent, the UE applies the value defined for the duplex mode and frequency range of this serving cell. See TS 38.133 [14], table 7.1.2-2. |
| ***rateMatchPatternToAddModList***Resources patterns which the UE should rate match PDSCH around. The UE rate matches around the union of all resources indicated in the rate match patterns. Rate match patterns defined here on cell level apply only to PDSCH of the same numerology (see TS 38.214 [19], clause 5.1.4,1). |
| ***shortBitmap***Bitmap when maximum number of SS/PBCH blocks per half frame equals to 4 as defined in TS 38.213 [13], clause 4.1. |
| ***ss-PBCH-BlockPower***Average EPRE of the resources elements that carry secondary synchronization signals in dBm that the NW used for SSB transmission, see TS 38.213 [13], clause 7. |
| ***ssb-periodicityServingCell***The SSB periodicity in ms for the rate matching purpose. If the field is absent, the UE applies the value ms5. (see TS 38.213 [13], clause 4.1) |
| ***ssb-PositionQCL***Indicates the QCL relation between SSB positions for this serving cell as specified in TS 38.213 [13], clause 4.1. |
| ***ssb-PositionsInBurst***For operation in licensed spectrum, indicates the time domain positions of the transmitted SS-blocks in a half frame with SS/PBCH blocks as defined in TS 38.213 [13], clause 4.1. The first/leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not transmitted while value 1 indicates that the corresponding SS/PBCH block is transmitted. The network configures the same pattern in this field as in the corresponding field in ServingCellConfigCommonSIB.For operation with shared spectrum channel access, only *mediumBitmap* is used and the UE assumes that one or more SS/PBCH blocks indicated by *ssb-PositionsInBurst* may be transmitted within the discovery burst transmission window and have candidate SS/PBCH blocks indexes corresponding to SS/PBCH block indexes provided by *ssb-PositionsInBurst* (see TS 38.213 [13], clause 4.1). If the k-th bit of *ssb-PositionsInBurst* is set to 1, the UE assumes that one or more SS/PBCH blocks within the discovery burst transmission window with candidate SS/PBCH block indexes corresponding to SS/PBCH block index equal to k – 1 may be transmitted; if the kt-th bit is set to 0, the UE assumes that the corresponding SS/PBCH block(s) are not transmitted. The k-th bit is set to 0, where k > *ssb-PositionQCL* and the number of actually transmitted SS/PBCH blocks is not larger than the number of 1's in the bitmap. The network configures the same pattern in this field as in the corresponding field in *ServingCellConfigCommonSIB*. |
| ***ssbSubcarrierSpacing***Subcarrier spacing of SSB. Only the values 15 kHz or 30 kHz (FR1), and 120 kHz or 240 kHz (FR2) are applicable. |
| ***supplementaryUplinkConfig***The network configures this field only if *uplinkConfigCommon* is configured. If this field is absent, the UE shall release the *supplementaryUplinkConfig* and the *supplementaryUplink* configured in *ServingCellConfig* of this serving cell, if configured. |
| ***tdd-UL-DL-ConfigurationCommon***A cell-specific TDD UL/DL configuration, see TS 38.213 [13], clause 11.1. |

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| **Conditional Presence** | **Explanation** |
| *AbsFreqSSB* | The field is absent when *absoluteFrequencySSB* in frequencyInfoDL is absent, otherwise the field is mandatory present. |
| *HOAndServCellAdd* | This field is mandatory present upon SpCell change and upon serving cell (PSCell/SCell) addition. Otherwise, the field is absent. |
| *HOAndServCellWithSSB* | This field is mandatory present upon SpCell change and upon serving cell (SCell with SSB or PSCell) addition. Otherwise, the field is absent. |
| *SharedSpectrum* | This field is mandatory present if this cell operates with shared spectrum channel access. Otherwise, it is absent, Need R. |
| *TDD* | The field is optionally present, Need R, for TDD cells; otherwise it is absent. |

– *ServingCellConfigCommonSIB*

The IE *ServingCellConfigCommonSIB* is used to configure cell specific parameters of a UE's serving cell in SIB1.

***ServingCellConfigCommonSIB* information element**

-- ASN1START

-- TAG-SERVINGCELLCONFIGCOMMONSIB-START

ServingCellConfigCommonSIB ::= SEQUENCE {

 downlinkConfigCommon DownlinkConfigCommonSIB,

 uplinkConfigCommon UplinkConfigCommonSIB OPTIONAL, -- Need R

 supplementaryUplink UplinkConfigCommonSIB OPTIONAL, -- Need R

 n-TimingAdvanceOffset ENUMERATED { n0, n25600, n39936 } OPTIONAL, -- Need S

 ssb-PositionsInBurst SEQUENCE {

 inOneGroup BIT STRING (SIZE (8)),

 groupPresence BIT STRING (SIZE (8)) OPTIONAL -- Cond FR2-Only

 },

 ssb-PeriodicityServingCell ENUMERATED {ms5, ms10, ms20, ms40, ms80, ms160},

 tdd-UL-DL-ConfigurationCommon TDD-UL-DL-ConfigCommon OPTIONAL, -- Cond TDD

 ss-PBCH-BlockPower INTEGER (-60..50),

 ...,

 [[

 channelAccessMode-r16 CHOICE {

 dynamic NULL,

 semiStatic SemiStaticChannelAccessConfig-r16

 } OPTIONAL, -- Cond SharedSpectrum

 discoveryBurstWindowLength-r16 ENUMERATED {ms0dot5, ms1, ms2, ms3, ms4, ms5} OPTIONAL, -- Need R

 highSpeedConfig-r16 HighSpeedConfig-r16 OPTIONAL -- Need R

 ]],

 [[

 highSpeedConfigFR2-r17 HighSpeedConfigFR2-r17 OPTIONAL -- Need R

 ]]

}

-- TAG-SERVINGCELLCONFIGCOMMONSIB-STOP

-- ASN1STOP

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| ***ServingCellConfigCommonSIB* field descriptions** |
| ***channelAccessMode***If present, this field indicates which channel access procedures to apply for operation with shared spectrum channel access as defined in TS 37.213 [48]. If the field is configured as "semiStatic", the UE shall apply the channel access procedures for semi-static channel occupancy as described in subclause 4.3 in TS 37.213. If the field is configured as "dynamic"t, the UE shall apply the channel access procedures in TS 37.213, with the exception of subclause 4.3 of TS 37.213. |
| ***discoveryBurstWindowLength***Indicates the window length of the discovery burst in ms (see TS 37.213 [48]). |
| ***groupPresence***This field is present when maximum number of SS/PBCH blocks per half frame equals to 64 as defined in TS 38.213 [13], clause 4.1. The first/leftmost bit corresponds to the SS/PBCH index 0-7, the second bit corresponds to SS/PBCH block 8-15, and so on. Value 0 in the bitmap indicates that the SSBs according to *inOneGroup* are absent. Value 1 indicates that the SS/PBCH blocks are transmitted in accordance with *inOneGroup*. |
| ***inOneGroup***When maximum number of SS/PBCH blocks per half frame equals to 4 as defined in TS 38.213 [13], clause 4.1, only the 4 leftmost bits are valid; the UE ignores the 4 rightmost bits. When maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [13], clause 4.1, all 8 bits are valid. The first/ leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. When maximum number of SS/PBCH blocks per half frame equals to 64 as defined in TS 38.213 [13], clause 4.1, all 8 bit are valid; The first/ leftmost bit corresponds to the first SS/PBCH block index in the group (i.e., to SSB index 0, 8, and so on); the second bit corresponds to the second SS/PBCH block index in the group (i.e., to SSB index 1, 9, and so on), and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not transmitted while value 1 indicates that the corresponding SS/PBCH block is transmitted. |
| ***n-TimingAdvanceOffset***The N\_TA-Offset to be applied for random access on this serving cell. If the field is absent, the UE applies the value defined for the duplex mode and frequency range of this serving cell. See TS 38.133 [14], table 7.1.2-2. |
| ***ssb-PositionsInBurst***Time domain positions of the transmitted SS-blocks in an SS-burst as defined in TS 38.213 [13], clause 4.1.For operation with shared spectrum channel access, only *inOneGroup* is used and the UE interprets this field same as *mediumBitmap* in *ServingCellConfigCommon*. The UE assumes that a bit at position k > $N\_{SSB}^{QCL}$ is 0, where $N\_{SSB}^{QCL}$ is obtained from *MIB* as specified in TS 38.213 [13], clause 4.1. |
| ***ss-PBCH-BlockPower***Average EPRE of the resources elements that carry secondary synchronization signals in dBm that the NW used for SSB transmission, see TS 38.213 [13], clause 7. |

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| **Conditional Presence** | **Explanation** |
| *FR2-Only* | This field is mandatory present for an FR2 carrier frequency. It is absent otherwise and UE releases any configured value. |
| *SharedSpectrum* | This field is mandatory present if this cell operates with shared spectrum channel access. Otherwise, it is absent, Need R. |
| *TDD* | The field is optionally present, Need R, for TDD cells; otherwise it is absent. |

*Next Modified Subclause*

*End of Changes*