**3GPP TSG-RAN4 Meeting #102-e *R4-XXXXXX***

 **Electronic Meeting, 21th February – 3rd March, 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **darftCR** | **<CR#>** | **rev** | - | **Current version:** | **17.4.0** |  |
|  |
| *For* [***HELP***](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:***  | On RRM enhancement for NR high speed train scenario in FR2 |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_HST\_FR2 -Core |  | ***Date:*** | 2022-02-25 |
|  |  |  |  |  |
| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Introduction of requirments within RRM enhancement for NR high speed train scenario in FR2 |
|  |  |
| ***Summary of change:*** | Update Re-establishment for FR2 with highspeed configuration. No handover related clause because no enhancement is needed. |
|  |  |
| ***Consequences if not approved:*** | No requirements for FR2 in HST senario |
|  |  |
| ***Clauses affected:*** | 6.2.1 |
|  |  |
|  | **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 ...  |
|  |  |
| ***Other comments:*** |  |

## << Start of change 1>>

# 6 RRC\_CONNECTED state mobility

## 6.2 RRC Connection Mobility Control

### 6.2.1 SA: RRC Re-establishment

#### 6.2.1.2 Requirements

In RRC\_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within Tre-establish\_delay seconds from the moment it detects a loss in RRC connection. The total RRC connection delay (Tre-establish\_delay) shall be less than:

$$T\_{re-establish\\_delay}=T\_{UE\\_re-establish\\_delay}+T\_{UL\\_grant}$$

TUL\_grant: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay (TUE\_re-establish\_delay) is specified in clause 6.2.1.2.1.

##### 6.2.1.2.1 UE Re-establishment delay requirement

The UE re-establishment delay (TUE\_re-establish\_delay) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay (TUE\_re-establish\_delay) requirement shall be less than:

$$T\_{UE\\_re-establish\\_delay}=50 ms+T\_{identify\\_intra\\_NR}+\sum\_{i=1}^{N\_{freq}-1}T\_{identify\\_inter\\_NR,i}+T\_{SI-NR}+T\_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable if each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in clause 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and

- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and

- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

Tidentify\_intra\_NR: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the FR of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then Tidentify\_intra\_NR=0; otherwise Tidentify\_intra\_NR shall not exceed the values defined in Table 6.2.1.2.1-1 when *[highSpeedMeasFlagFR2]* isn’t configured or UE is not capable of FR2 power class 6 and Table 6.2.1.2.1-3 when *[highSpeedMeasFlagFR2]* is configured and UE is capable of FR2 power class 6.

Tidentify\_inter\_NR,i: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the FR of the target NR cell. Tidentify\_inter\_NR,i shall not exceed the values defined in Table 6.2.1.2.1-2.

TSMTC: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*, Tsmtc follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

TSMTC,i: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

TSI-NR: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

TPRACH: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. TPRACH can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

Nfreq: It is the total number of NR frequencies to be monitored for RRC re-establishment; Nfreq = 1 if the target intra-frequency NR cell is known, else Nfreq = 2 and Tidentify\_intra\_NR = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

Table 6.2.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

|  |  |  |
| --- | --- | --- |
| Serving cell  | FR of target NR  | Tidentify\_intra\_NR [ms] |
| SSB Ês/Iot (dB) | cell | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x TSMTC) | MAX (800 ms, 10 x TSMTC) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 80 x TSMTC)) |
| < -8 | FR1 | N/A | 800Note1 |
| < -8 | FR2 | N/A | 3520Note1 |
| Note 1: The UE is not required to successfullyidentify a cell on any NR frequency layer when TSMTC > 20 ms and serving cell SSB Ês/Iot < -8 dB. |

Table 6.2.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

|  |  |  |
| --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | FR of target NR cell | Tidentify\_inter\_NR, i [ms] |
|  |  | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x TSMTC, i) | MAX (800 ms, 13 x TSMTC, i) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 104 x TSMTC, i)) |
| < -8 | FR1 | N/A | 800Note1 |
| < -8 | FR2 | N/A | 4000Note1 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when TSMTC,i > 20 ms and serving cell SSB Ês/Iot < -8 dB. |

Table 6.2.1.2.1-3: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell When *[highSpeedMeasFlagFR2]*  is configured (Frequency range FR2)

|  |  |  |
| --- | --- | --- |
| Serving cell  | FR of target NR  | Tidentify\_intra\_NR [ms] |
| SSB Ês/Iot (dB) | cell | Known NR cell | Unknown NR cell |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 10 xN2 x TSMTC)) |
|  |  |  |  |
| Note 1: The UE is not required to successfullyidentify a cell on any NR frequency layer when TSMTC > 20 ms and serving cell SSB Ês/Iot < -8 dB.Note 2: When SMTC <= 40ms, N2=2 when *[highSpeedMeasFlagFR2]*  = [set1]; N2=6 when *[highSpeedMeasFlagFR2]* = [set2]; otherwise N2=8. |

## << END of change 1>>