**3GPP TSG-RAN WG4 Meeting # 104-e R4-22xxxxx**

**Electronic Meeting, August 15 – August 26, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-2** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.6.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR for TS 38.141-2, Introduce performance requirements for UL TA for FR2 HST | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | RAN4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST\_FR2-Perf | | | | |  | ***Date:*** | | | 2022-08-01 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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:*** | | Performance requirements for UL TA should be introduced for FR2 HST based on agreements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Change Table [A.4-2x] to Tables A.10-4, A.10-5, and A.10-6. 2. Change clause 12.2.2.7 to 12.2.2.8 for minimum requirement in TS 38.104. 3. Change TSRS =[10] to TSRS =80 in Table 8.2.5.4.2-1a. 4. Move clause 8.2.5.5a from the back of clause 8.2.5.6 to the front of clause 8.2.5.6. 5. Add FRC in Table 8.2.5.5a-1. 6. Remove [] for SNR in Table 8.2.5.5a-1. 7. Add ‘for FR2-1’ in title of Table 8.2.5.4.2-1a and Table 8.2.5.5a-1. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Performance requirements for UL TA for FR2 HST would be missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2.5.1, 8.2.5.2, 8.2.5.4.2, 8.2.5.5a | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## **<Start of Change 1>**

### 8.2.5 Performance requirements for UL timing adjustment

#### 8.2.5.1 Definition and applicability

The performance requirement of UL timing adjustment is determined by a minimum required throughput for the moving UE at given SNR. The performance requirements assume HARQ retransmissions. The performance requirements for UL timing adjustment scenario Y and scenario Z defined in Annex J.4 are optional. The performance requirements for UL timing adjustment scenario Y in FR2 apply only to FR2-2 below 30GHz.

In the tests for UL timing adjustment, two signals are configured, one being transmitted by a moving UE and the other being transmitted by a stationary UE. The transmission of SRS from UE is optional. FRC parameters in Tables A.4-2B, A.10-4, A.10-5, and A.10-6 are applied for both UEs. The received power for both UEs is the same. The resource blocks allocated for both UEs are consecutive. In scenario Y and scenario Z, Doppler shift is not taken into account.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.1.

#### 8.2.5.2 Minimum Requirement

The minimum requirement is in TS 38.104 [2] clause 12.2.1.5 and 12.2.2.8.

#### 8.2.5.3 Test Purpose

The test shall verify the receiver's ability to achieve throughput measured for the moving UE at given SNR under moving propagation conditions.

#### 8.2.5.4 Method of test

##### 8.2.5.4.1 Initial Conditions

Test environment: Normal, see annex B.2.

RF channels to be tested: M; see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

##### 8.2.5.4.2 Procedure

1) Place the BS with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the BS with the test system.

3) Set the BS in the declared direction to be tested.

4) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.2.5.4.2-1 and table 8.2.5.4.2-1a.

Table 8.2.5.4.2-1 Test parameters for testing UL timing adjustment for *BS type 1-O*

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Uplink-downlink allocation for TDD | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 4 |
|  | RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
|  | DM-RS duration | single-symbol DM-RS |
|  | Additional DM-RS position | pos2 |
|  | Number of DM-RS CDM group(s) without data | 2 |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
|  | DM-RS port | {0} |
|  | DM-RS sequence generation | NID0=0, nSCID =0 for moving UE  NID0=1, nSCID =1 for stationary UE |
| Time domain | PUSCH mapping type | A,B |
| resource assignment | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | 5 MHz CBW/15kHz: 12 RB for each UE  10MHz CBW/15kHz SCS: 25 RB for each UE  10MHz CBW/30kHz: 12 RB for each UE  40MHz CBW/30kHz SCS: 50 RB for each UE |
|  | Starting PRB index | Moving UE: 0  Stationary UE: 12 for 5MHz CBW/15kHz SCS, 25 for 10 MHz CBW/15kHz SCS, 12 for 10MHz CBW/30kHz SCS and 50 for 40 MHz CBW/30kHz SCS |
|  | Frequency hopping | Disabled |
| SRS resource allocation | Slots in which sounding RS is transmitted (Note 1) | For FDD: slot #1 in radio frames  For TDD:  - last symbol in slot #3 in radio frames for 15KHz  - last symbol in slot #7 in radio frames for 30KHz |
|  | SRS resource allocation | 15 kHz SCS:  - CSRS =5, BSRS =0, for 20 RB  - CSRS = 11, BSRS =0, for 40 RB  30 kHz SCS:  - CSRS =5, BSRS =0, for 20 RB  - CSRS = 21, BSRS =0, for 80 RB |
| NOTE 1. The transmission of SRS is optional. And the transmission comb and SRS periodic are configured as KTC = 2, and TSRS = 10 respectively. | | |

Table 8.2.5.4.2-1a Test parameters for testing UL timing adjustment for *BS type 2-O* for FR2-1

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Uplink-downlink allocation for TDD | | 120 kHz SCS:  3D1S1U, S=10D:2G:2U |
| Channel bandwidth | | 120 kHz SCS: 50MHz, 200 MHz |
| HARQ | Maximum number of HARQ transmissions | 4 |
|  | RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
|  | DM-RS duration | single-symbol DM-RS |
|  | DM-RS position (*l0*) | 2 |
|  | Additional DM-RS position | pos0, pos1, pos2 |
|  | Number of DM-RS CDM group(s) without data | 2 |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
|  | DM-RS port | {0} |
| Time domain resource assignment | DM-RS sequence generation | NID0=0, nSCID =0 for moving UE  NID0=1, nSCID =1 for stationary UE |
|  | PUSCH mapping type | B |
|  | Allocation length | 10 |
| Frequency domain resource assignment | RB assignment | 50 MHz CBW/120kHz SCS: 16 RB for each UE  200MHz CBW/120kHz SCS: 66 RB for each UE |
|  | Starting PRB index | Moving UE: 0  Stationary UE: 16 for 50MHz CBW, 66 for 200MHz CBW for SCS 120kHz |
|  | Frequency hopping | Disabled |
| SRS resource allocation | Slots in which sounding RS is transmitted (Note 1) | For TDD:  - last symbol in slot #3 in radio frames for 120KHz |
|  | SRS resource allocation | 120 kHz SCS:  - CSRS = 9, BSRS =0, for 32 RB  - CSRS = 33, BSRS =0, for 132 RB |
| NOTE 1. The transmission of SRS is optional. And the transmission comb and SRS periodic are configured as KTC = 2, and TSRS =80 respectively. | | |

The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J. Unless stated otherwise, the MIMO correlation matrices for the gNB are defined in annex J for low correlation.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the BS receiver is as specified in clause 8.2.5.5 for high speed train and clause 8.2.5.6 for normal mode and that the SNR at the BS receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.2.5.4.2-2.

Table 8.2.5.4.2-2: AWGN power level at the BS input

|  |  |  |  |
| --- | --- | --- | --- |
| BS type | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 1-O (NOTE 2) | 15 | 5 | -86.5dBm - ΔOTAREFSENS dBm / 4.5MHz |
| 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz |
| 30 | 10 | -83.6 dBm - ΔOTAREFSENS dBm / 8.64MHz |
| 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
| 2-O (NOTE 3) | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
|  |  | 200 | EISREFSENS\_50M + ΔFR2\_REFSENS + 21 dBm / 190.08 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level.  NOTE 3: The AWGN power level contains an AWGN offset of 15dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | | |

8) For reference channels applicable to the BS, measure the throughput.

#### 8.2.5.5 Test Requirement for High Speed Train *for BS type 1-O*

The throughput measured for the moving UE according to clause 8.2.5.4.2 shall not be below the limits for the SNR levels specified in table 8.2.5.5-1 for mapping type A and table 8.2.5.5-2 for mapping type B respectively.

Table 8.2.5.5-1 Test requirements for UL timing adjustment with mapping type A for high speed train

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex J) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | 5 | 15 | Scenario Y | G-FR1-A4-31A | 8.5 |
| Scenario Z | G-FR1-A4-31A | 8.6 |
| 10 | 15 | Scenario Y | G-FR1-A4-31 | 8.8 |
|  |  | Scenario Z | G-FR1-A4-31 | 8.7 |
| 10 | 30 | Scenario Y | G-FR1-A4-32A | 8.6 |
| Scenario Z | G-FR1-A4-32A | 8.6 |
| 40 | 30 | Scenario Y | G-FR1-A4-32 | 8.7 |
|  |  |  | Scenario Z | G-FR1-A4-32 | 8.8 |

Table 8.2.5.5-2 Test requirements for UL timing adjustment with mapping type B for high speed train

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex J) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | 5 | 15 | Scenario Y | G-FR1-A4-31A | 8.6 |
| Scenario Z | G-FR1-A4-31A | 8.6 |
| 10 | 15 | Scenario Y | G-FR1-A4-31 | 8.8 |
|  |  | Scenario Z | G-FR1-A4-31 | 8.8 |
| 10 | 30 | Scenario Y | G-FR1-A4-32A | 8.6 |
| Scenario Z | G-FR1-A4-32A | 8.7 |
| 40 | 30 | Scenario Y | G-FR1-A4-32 | 8.7 |
|  |  |  | Scenario Z | G-FR1-A4-32 | 8.8 |

#### 8.2.5.5a Test Requirement for High Speed Train *for BS type 2-O*

The throughput measured for the moving UE according to clause 8.2.5.4.2 shall not be below the limits for the SNR levels specified in table 8.2.5.5a-1 for mapping type B.

Table 8.2.5.5a-1 Minimum requirements for UL timing adjustment with mapping type B for high speed train for FR2-1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex J) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | 50 | 120 | Scenario Y | G-FR2-A10-7 | 9.7 |
|  |  |  |  |  | Scenario Y | G-FR2-A10-9, G-FR2-A10-11 | 9.4 |
|  |  |  | 200 | 120 | Scenario Y | G-FR2-A10-8 | 9.6 |
|  |  |  |  |  | Scenario Y | G-FR2-A10-10, G-FR2-A20-12 | 9.5 |

#### 8.2.5.6 Test Requirement for Normal Mode

The throughput measured for the moving UE according to clause 8.2.5.4.2 shall not be below the limits for the SNR levels specified in table 8.2.5.6-1 for mapping type A and table 8.2.5.6-2 for mapping type B respectively.

Table 8.2.5.6-1 Test requirements for UL timing adjustment with mapping type A for normal mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex J) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | 5 | 15 | Scenario X | G-FR1-A4-31A | 11.2 |
| 10 | 15 | Scenario X | G-FR1-A4-31 | 11.8 |
| 10 | 30 | Scenario X | G-FR1-A4-32A | 11.4 |
| 40 | 30 | Scenario X | G-FR1-A4-32 | 12.6 |

Table 8.2.5.6-2 Test requirements for UL timing adjustment with mapping type B for normal mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex J) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | 5 | 15 | Scenario X | G-FR1-A4-31A | 11.2 |
| 10 | 15 | Scenario X | G-FR1-A4-31 | 11.9 |
| 10 | 30 | Scenario X | G-FR1-A4-32A | 11.3 |
| 40 | 30 | Scenario X | G-FR1-A4-32 | 13.0 |



## **<End of Change 1>**