**3GPP TSG-RAN4 Meeting #97-e *R4-2017599***

**Electronic Meeting, 2nd Nov – 13th Nov, 2020**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-1** | **CR** | **0158** | **rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *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:*** | CR on UL timing adjustment conducted performance requirement for TS 38.141-1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST-Perf | | | | |  | ***Date:*** | | | 2020-10-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | UL timing adjustment requirement have been introduced for NR HST in Rel-16. Additional scenario X for UL timing adjustment have been agreed to be introduced | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add the applicability rule for UL timing adjustment requirement for different scenarios in section 8.1.2.1.6  Add the requirement of UL timing adjustment scenario X  Add the scenario X for moving propation in Annex G.4  Update the requirement based on the latest simulation summary | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Ul timing adjustment can not be verified correctly | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.1.2.1.6, 8.2.5 and G.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.141-2 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR … CR … | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR’s revision history:*** | |  | | | | | | | | |

<Start of change 1>

8.1.2.1.5 Applicability of requirements for TDD with different UL-DL patterns

8.1.2.1.6 Applicability of UL timing adjustment requirements for different scenarios

Unless otherwise stated, the tests for UL timing adjustment for scenario Y and scenario Z shall apply only if high speed train is declared to be supported (see D.109 in table 4.6-1). A BS that passes the tests for scenario Y or scenario Z, can also consider the tests for scenario X passed.

<End of change 1>

<Start of change 2>

### 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 measured 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 G.4 are optional.

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 Table A.4-2B 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 8.2.5.

#### 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.

##### 8.2.5.4.2 Procedure

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to all BS antenna connectors for diversity reception via a combining network as shown in annex D.5 and D.6 for BS type 1-C and type 1-H respectively.

2) Adjust the AWGN generator, according to combination of SCS and channel bandwidth defined in table 8.2.5.4.2-1.

Table 8.2.5.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 15 | 5 | -86.5 dBm / 4.5MHz |
|  | 10 | -83.3 dBm / 9.36MHz |
| 30 | 10 | -86.3 dBm / 8.64MHz |
|  | 40 | -77.2 dBm / 38.16MHz |

3) The characteristics of the wanted signals (transmitted by moving UE) shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameters in Table 8.2.5.4.2-2.

Table 8.2.5.4.2-2 Test parameters for testing UL timing adjustment

|  |  |  |
| --- | --- | --- |
| 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(s) | {0} |
|  | DM-RS sequence generation | NID0=0, nSCID =0 for moving UE  NID0=1, nSCID =1 for stationary UE |
| Time domain resource assignment | PUSCH mapping type | A, B |
|  | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | 5 MHz CBW/15kHz SCS: 12 RB for each UE  10MHz CBW/15kHz SCS: 25 RB for each UE  10MHz CBW/30kHz SCS: 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:  C\_SRS =5, B\_SRS =0, for 20 RB  C\_SRS = 11, B\_SRS =0, for 40 RB  30 kHz SCS:  C\_SRS =5, B\_SRS =0, for 20 RB  C\_SRS = 21, B\_SRS =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. | | |

4) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex G.4.

5) Adjust the equipment so that required SNR specified in Table 8.2.5.5-1 to Table 8.2.5.5-2 is achieved at the BS input for high speed train.

Ajust the equipment so that required SNR specified in Table 8.2.5.6-1 to Table 8.2.5.6-2 is acehived at the BS input for normal mode.

6) For each of the reference channels in Table 8.2.5.5-1 to Table 8.2.5.5-2 appliable for the base station, measure the throughput for high speed train.

For each of the reference channels in Table 8.2.5.6-1 to Table 8.2.5.6-2 appliable for the base station, measure the throughput for normal mode.

#### 8.2.5.5 Test Requirement for High Speed Train

The throughput shall be ≥ 70% of the maximum throughput of the reference measurement channel as specified in annex A for the moving UE at the SNR given 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 RX antennas | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
|  |  |  | 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 |
| 1 | 2 | Normal |  |  | 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 RX antennas | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
|  |  |  | 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 |
| 1 | 2 | Normal |  |  | 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] |

8.2.5.6 Test Requirement for Normal Mode

The throughput shall be ≥ 70% of the maximum throughput of the reference measurement channel as specified in annex A for the moving UE at the SNR given 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**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
|  |  |  | 5 | 15 | Scenario X | G-FR1-A4-31A | [11.2] |
| 1 | 2 | Normal | 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**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Channel Bandwidth [MHz] | SCS [kHz] | Moving propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
|  |  |  | 5 | 15 | Scenario X | G-FR1-A4-31A | [11.2] |
| 1 | 2 | Normal | 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 2>

<Start of change 3>

# G.4 Moving propagation conditions

Figure G.4-1 illustrate the moving propagation conditions for the test of the UL timing adjustment performance. The time difference between the reference timing and the first tap is according Equation (G.4-1). The timing difference between moving UE and stationary UE is equal to Δτ - (*TA* −31)×16×64*Tc* for 15kHz SCS and Δτ - (*TA* −31)×16×32*Tc* for 30kHz SCS. The relative timing among all taps is fixed. The parameters for the moving propagation conditions are shown in Table G.4-1.



Figure G.4-1: Moving propagation conditions

 (G.4-1)

Table G.4-1: Parameters for UL timing adjustment

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Scenario X | Scenario Y | Scenario Z |
| Channel model | Stationary UE: AWGN  Moving UE: TDLC300-400 | Stationary UE: AWGN  Moving UE: AWGN | Sationary UE: AWGN  Moving UE: AWGN |
| UE speed | 120 km/h | 350 km/h | 500 km/h |
| CP length | Normal | Normal | Normal |
| A | 15 kHz: 10 s  30 kHz: 5 s | 15 kHz: 10 s  30 kHz: 5 s | 15 kHz: 10 s  30 kHz: 5 s |
|  | 15 kHz: 0.04 s-1  30 kHz: 0.08 s-1 | 15 kHz: 0.13 s-1  30 kHz: 0.26 s-1 | 15 kHz: 0.18 s-1  30 kHz: 0.36 s-1 |

NOTE: Doppler shift is not taken into account in UL TA scenario Y and scenario Z.

<End of change 3>