**3GPP TSG-RAN WG4 Meeting # 97-eR4-2017558**

**Electronic meeting, 2 - 13 Nov., 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-2** | **CR** | **0228** | **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 for 38.141-2: Introduction of NR PUSCH UL timing adjustment performance requirement for scenario X | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST-Perf | | | | |  | ***Date:*** | | | 2020-10-12 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Scenario X for UL timing adjustment has been agreed in RAN4#96e meeting in non-HST part as well as the additional CBWs. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Add Applicability of UL timing adjustment requirements for different scenarios in new section 8.1.2.1.6 2. Capture the test parameters of UL TA for 5MHz/15kHz and 10MHz/30kHz in Table 8.2.5.4.2-1. 3. Capture AWGN power level for the additional CBW/SCS in Table 8.2.5.4.2-2. 4. Change the title of clause 8.2.5.5 for high speed train, and add performance requirements for additional CBW/SCS for scenario Y and scenario Z in Table 8.2.5.5-1 and 8.2.5.5-2. 5. Add performance requirements for scenario X in Table 8.2.5.6-1 and 8.2.5.6-2 in new clause 8.2.5.6. 6. Add FRCs for the additional CBW/SCS in Table A.4-2B. 7. Add parameters for scenario X in Table J.4-1. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The performance requirements for UL timing adjustment for scenario X and additional CBW/SCS would be missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.1.2.1.6, 8.2.5.1, 8.2.5.4.2, 8.2.5.5, A.4, J.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.104 | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.141-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revison of R4-2014427 | | | | | | | | |

*<Start of Change 1>*

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

Unless otherwise stated, for each subcarrier spacing declared to be supported, if BS supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

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 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.

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 12.2.1.5.

#### 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.

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.

Table 8.2.5.4.2-1 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 | {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. | | |

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 | 15 | 5 | -86.5dBm - ΔOTAREFSENS dBm / 4.5MHz |
| 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz |
| 30 | 10 | -86.3 dBm - ΔOTAREFSENS dBm / 8.64MHz |
| 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1. | | | |

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

#### 8.2.5.5 Test Requirement for High Speed Train

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] |

#### 8.2.5.6 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 2>*

*<Start of Change 3>*

# A.4 Fixed Reference Channels for performance requirements (16QAM, R=658/1024)

*<< Unchanged sections are omitted >>*

Table A.4-2B: FRC parameters for FR1 UL timing adjustment, PUSCH with transform precoding disabled, *Additional DM-RS position = pos2* and 1 transmission layer (16QAM, R=658/1024)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference channel | G-FR1-A3-31A | G-FR1-A4-31 | G-FR1-A4-32A | G-FR1-A4-32 |
| Subcarrier spacing [kHz] | 15 | 15 | 30 | 30 |
| Allocated resource blocks | 12 | 25 | 12 | 50 |
| Data bearing CP-OFDM Symbols per slot (Note 1) | 11 | 11 | 11 | 11 |
| Modulation | 16QAM | 16QAM | 16QAM | 16QAM |
| Code rate (Note 2) | 658/1024 | 658/1024 | 658/1024 | 658/1024 |
| Payload size (bits) | 4032 | 8456 | 4032 | 16896 |
| Transport block CRC (bits) | 24 | 24 | 24 | 24 |
| Code block CRC size (bits) | - | 24 | - | 24 |
| Number of code blocks - C | 1 | 2 | 1 | 3 |
| Code block size including CRC (bits) (Note 2) | 4056 | 4264 | 4056 | 5664 |
| Total number of bits per slot | 6336 | 13200 | 6336 | 26400 |
| Total data bearing resource elements per slot | 1584 | 3300 | 1584 | 6600 |
| NOTE 1: *DM-RS configuration type*  = 1 with *DM-RS duration = single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos2*, and *l0* = 2 for PUSCH mapping type A, *l0* = 0 for PUSCH mapping type B, as per table 6.4.1.1.3-3 of TS 38.211 [5].  NOTE 2: Code block size including CRC (bits) equals to *K'* in clause 5.2.2 of TS 38.212 [15]. | | | | |

*<< Unchanged sections are omitted >>*

*<End of Change 3>*

*<Start of Change 4>*

# J.4 Moving propagation conditions

Figure J.4-1 illustrates 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 (J.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 J.4-1.



Figure J.4-1: Moving propagation conditions

 (J.4-1)

Table J.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 | Stationary 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 4>*