**3GPP TSG-RAN WG4 Meeting #** **103-e R4-221xxxx**

**Electronic Meeting, May 09 – May 20, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.174** | **CR** |   | **rev** | **-** | **Current version:** | **16.6.0** |  |
|  |
| *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:***  | Big CR on TS 38.174 Maintenance |
|  |  |
| ***Source to WG:*** | ZTE Corporation |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_IAB\_enh-Perf |  | ***Date:*** | 2022-05-24 |
|  |  |  |  |  |
| ***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 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:*** | This is a big CR containing these draft CRs endorsed in RAN4#103-e:(1) R4-2208734(2) R4-2208931 |
|  |  |
| ***Summary of change:*** | (1) Correct in the corresponding places that the test configuration / requirements are for IAB-MT, not UE.(2) Remove gap related aspects in core and performance requirements.* Remove gap in 12.3.2.3.2
* Remove gap configuration in G.2.3.2.1 and G.2.3.2.3
 |
|  |  |
| ***Consequences if not approved:*** | (1)The RRM test cases for IAB-MT will contain content related to UE while there is no UE in the test.(2) The requirements are incorrect. |
|  |  |
| ***Clauses affected:*** | 12.3.2.3.2, G.2.1.1.2.2.2, G.2.3.2.1, G.2.3.2.3, and G.2.3.2.3.2  |
|  |  |
|  | **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 >

#### 12.3.2.3 Requirements for CSI-RS based beam failure detection

##### 12.3.2.3.1 Introduction

The UE requirements in sub-clause 8.5.3.1 [6] apply for IAB-MT.

##### 12.3.2.3.2 Minimum requirement

IAB-MT shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set  estimated over the last TEvaluate\_BFD\_CSI-RS ms period becomes worse than the threshold Qout\_LR\_CSI-RS within TEvaluate\_BFD\_CSI-RS ms period.

The value of TEvaluate\_BFD\_CSI-RS is defined in Table 12.3.2.3.2-1 for FR1.

The value of TEvaluate\_BFD\_CSI-RS is defined in Table 12.3.2.3.2-2 for FR2 with N=1.

The requirements of TEvaluate\_BFD\_CSI-RS apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1,

- P = 1.

For FR2,

- P = 1, when the BFD-RS resource is not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P = Psharing factor, when BFD-RS resource is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- Psharing factor = 3**.**

If the IAB-MT is not capable of 4 SMTC configurations per frequency [15], and is provided with higher layer signaling of smtcj, where 1≤*j*≤2 [15], then TSMTCperiod follows smtcjmax where jmax is the maximum value of all j for which smtcj has been configured.

If the IAB-MT is capable of 4 SMTC configurations per frequency [15], and is provided with higher layer signaling of smtcj, where 1≤*j*≤4 [15], then TSMTCperiod follows smtcjmax where jmax is the maximum value of all j for which smtcj has been configured.

NOTE: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the BFD-RS resource and SMTC occasion configurations does not meet pervious conditions.

### <End of Change 1>

### <Start of Change 2>

G.2.1.1.2.2.2 Test Parameters

Supported test configurations are shown in table G.2.1.1.2.2.2-1. The time delay is tested by using the parameters in table G.2.1.1.2.2.2-2, and G.2.1.1.2.2.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the IAB-MT during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the IAB-MT. Prior to time duration T2, the IAB-MT shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

*<unchanged part omitted>*

### <End of Change 2>

### <Start of Change 3 >

G.2.3.2 Beam Failure Detection and Link Recovery Procedure

G.2.3.2.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR

G.2.3.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the IAB-MT properly detects SSB-based beam failure in the set q0 configured for a serving cell and that the IAB-MT performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the IAB-MTs active DL BWP, during the evaluation period, and link recovery. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 12.3.2.

The test parameters are given in Tables G.2.3.2.1.1-1, G.2.3.2.1.1-2 and G.2.3.2.1.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure G.2.3.2.1.1-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure G.2.3.2.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the IAB-MT shall be fully synchronized to cell 1. The IAB-MT shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The IAB-MT is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

**Table G.2.3.2.1.1-1: Supported test configurations for FR1 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 2 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| Note: The IAB-MT is only required to pass in one of the supported test configurations in FR1 |

**Table G.2.3.2.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
|  |  | **Test 1** |  |
| Active PSCell |  | Cell 1 |  |
| RF Channel Number |  | 1 |  |
| Duplex mode | Config 1, 2 |  | TDD |  |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 |  |
|  | Config 2 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | Config 1, 2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | Config 1, 2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | Config 1, 2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | Config 1, 2 |  | ULBWP.1.1 |  |
| CORESET Reference Channel | Config 1 |  | CR.1.1 TDD |  |
|  | Config 2 |  | CR.2.1 TDD |  |
| SSB Configuration | Config 1 |  | SSB.3 FR1 |  |
|  | Config 2 |  | SSB.4 FR1 |  |
| SMTC Configuration | Config 1 |  | SMTC.1 |  |
|  | Config 2 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 15 KHz |  |
|  | Config 2 |  | 30 KHz |  |
| PRACH Configuration | Config 1 |  | Table G.X |  |
|  | Config 2 |  | Table G.X |  |
| SSB Index assigned as BFD RS (q0) |  | 0 |  |
| SSB Index assigned as CBD RS (q1) |  | 1 |  |
| OCNG parameters |  | OP.1 |  |
| CP length  |  | Normal |  |
| Correlation Matrix and Antenna Configuration |  | 2x2 Low |  |
| Beam failure detection transmission parameters  | DCI format |  | 1-0 |  |
| Number of Control OFDM symbols |  | 2 |  |
| Aggregation level  | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
| DMRS precoder granularity |  | REG bundle size |  |
| REG bundle size |  | 6 |  |
|  |  |  |  |
|  |  |  |  |
| rlmInSyncOutOfSyncThreshold |  | absent | When the field is absent, the IAB-MT applies the value 0. (Table 8.1.1-1 of TS 38.133). |
| rsrp-ThresholdSSB | Config 1 | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  | Config 2 |  | -95 |  |
| powerControlOffsetSS |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount |  | n1 | see clause 5.17 of TS 38.321 [14] |
| beamFailureDetectionTimer |  | pbfd4 | see clause 5.17 of TS 38.321 [14] |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 TDD |  |
|  | Config 2 |  | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking  | Config 1 |  | TRS.1.1 TDD |  |
|  | Config 2 |  | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS |  | 0, 1 |  |  |
| T310 Timer | ms | 1000 |  |  |
| N310 |  | 2 |  |  |
| T1 | s | 0.2 | During this time the the IAB-MT shall be fully synchronized to cell 1 |
| T2 | s | 0.37 |  |
| T3 | s | 0.24 |  |
| T4 | s | 0 |  |
| T5 | s | 0.17 |  |
| D1 | s | 0.13 |  |
| Note 1: All configurations are assigned to the IAB-MT prior to the start of time period T1.Note 2: IAB-MT-specific PDCCH is not transmitted after T1 starts. |

**Table G.2.3.2.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 |
| EPRE ratio of PDCCH to PDCCH DMRS | dB |  |
| EPRE ratio of PBCH DMRS to SSS | dB |  |
| EPRE ratio of PBCH to PBCH DMRS | dB |  |
| EPRE ratio of PSS to SSS | dB |  |
| EPRE ratio of PDSCH DMRS to SSS  | dB |  |
| EPRE ratio of PDSCH to PDSCH DMRS | dB |  |
| EPRE ratio of OCNG DMRS to SSS | dB |  |
| EPRE ratio of OCNG to OCNG DMRS | dB |  |
| SNR\_SSB of set q0 | Config 1 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2 |  | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 2 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 KHz | -98 |
|  | Config 2 |  | -98 |
| Propagation condition |  | TDL-C 300ns 100Hz |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: The uplink resources for CSI reporting are assigned to the IAB-MT prior to the start of time period T1.Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the IAB-MT prior to the start of time period T1.Note 4: Void.Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.Note 6: The signal contains PDCCH for IAB-MTs other than the device under test as part of OCNG.Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure G.2.3.2.1.1-1.Note 9: The SNR values are specified for testing a IAB-MT which supports 2RX on at least one band. For testing of a IAB-MT which supports 4RX on all bands, the SNR during T3 is modified as specified in clause G.1.3. |

### <End of Change 3>

### <Start of Change 4>

G.2.3.2.3 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR

G.2.3.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the IAB-MT properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell and that the IAB-MT performs correct CSI-RS-based link recovery based on beam candicate set q1. The purpose is to test the downlink monitoring for beam failure detection within the IAB-MTs active DL BWP, during the evaluation period, and link recovery. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 12.3.2.

The test parameters are given in Tables G.2.3.2.3.1-1, G.2.3.2.3.1-2 and G.2.3.2.3.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure G.2.3.2.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure. Figure G.2.3.2.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the IAB-MT shall be fully synchronized to cell 1. The IAB-MT shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms.

**Table G.2.3.2.3.1-1: Supported test configurations for FR1 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 2 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| Note: The IAB-MT is only required to pass in one of the supported test configurations in FR1 |

**Table G.2.3.2.3.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
|  |  | **Test 1** |  |
| Active PCell  |  | Cell 1 |  |
| RF Channel Number |  | 1 |  |
| Duplex mode | Config 1, 2 |  | TDD |  |
| CORESET Reference Channel | Config 1 |  | CR.1.1 TDD |  |
| Config 2 |  | CR.2.1 TDD |  |
| SSB Configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.2 FR1 |  |
| SMTC Configuration | Config 1 |  | SMTC.1 | G.1.6 |
| Config 2 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 15 KHz |  |
| Config 2 |  | 30 KHz |  |
| csi-RS-Index assigned as beam failure detection RS in set q0 |  | 0 |  |
| OCNG parameters |  | OP.1 | G.1.2.1 |
| CP length  |  | Normal |  |
| Correlation Matrix and Antenna Configuration |  | 2x2 Low |  |
| Beam failure detection transmission parameters | DCI format |  | 1-0 |  |
| Number of Control OFDM symbols |  | 2 |  |
| Aggregation level  | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
| DMRS precoder granularity |  | REG bundle size |  |
| REG bundle size |  | 6 |  |
|  |  |  |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 |  | 1 | N |
| rlmInSyncOutOfSyncThreshold |  | absent | When the field is absent, the IAB-MT applies the value 0. (Table 8.1.1-1of TS 38.133). |
| rsrp-ThresholdSSB | Config 1 | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
| Config 2 |  | -95 |  |
| powerControlOffsetSS |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount |  | n1 | see clause 5.17 of TS 38.321 [14] |
| beamFailureDetectionTimer |  | pbfd4 | see clause 5.17 of TS 38.321 [14] |
| CSI-RS configuration for q0 and q1 | Config 1 |  | CSI-RS.1.2 TDD |  |
|  | Config 2 | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 TDD |  |
|  | Config 2 |  | CSI-RS.2.1 TDD |  |
| TRS configuration | Config 1 |  | TRS.1.1 TDD |  |
|  | Config 2 |  | TRS.1.2 TDD |  |
| CSI-RS-Index assigned as RLM RS | Config 1 |  | CSI-RS.1.2 TDD |  |
|  | Config 2 |  | CSI-RS.2.2 TDD |  |
| T310 Timer | ms | 1000 |  |
| N310 |  | 2 |  |
| T1 | s | 0.2 | During this time the the IAB-MT shall be fully synchronized to cell 1 |
| T2 | s | 0.18 |  |
| T3 | s | 0.14 |  |
| T4 | s | 0 |  |
| T5 | s | 0.08 |  |
| D1 | s | 0.04 |  |
| Note 1: IAB-MT-specific PDCCH is not transmitted after T1 starts. |

**Table G.2.3.2.3.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 |
| EPRE ratio of PDCCH to PDCCH DMRS | dB |  |
| EPRE ratio of PBCH DMRS to SSS | dB |  |
| EPRE ratio of PBCH to PBCH DMRS | dB |  |
| EPRE ratio of PSS to SSS | dB |  |
| EPRE ratio of PDSCH DMRS to SSS  | dB |  |
| EPRE ratio of PDSCH to PDSCH DMRS | dB |  |
| EPRE ratio of OCNG DMRS to SSS | dB |  |
| EPRE ratio of OCNG to OCNG DMRS | dB |  |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2 |  | -10 | -10 | 10 | 10 | 10 |
| CSI-RS\_RP of set q1 | Config 1 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 2 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 KHz | -98 |
|  | Config 2 |  | -98 |
| Propagation condition |  | TDL-C 300ns 100Hz |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: The uplink resources for CSI reporting are assigned to the IAB-MT prior to the start of time period T1.Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the IAB-MT prior to the start of time period T1.Note 4: VoidNote 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.Note 6: The signal contains PDCCH for IAB-MTs other than the device under test as part of OCNG.Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure G.2.3.2.2.1-1.Note 9: The SNR values are specified for testing a IAB-MT which supports 2RX on at least one band. For testing of a IAB-MT which supports 4RX on all bands, the SNR during T3 is modified as specified in clause G.1.3. |

### <End of Change 4>

### <start of the change 5>

G.2.3.2.3.2 Test Requirements

The IAB-MT behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the IAB-MT shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

*<unchanged part omitted>*

### <end of the change 5>