3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-2106953

Electronic Meeting, Apr. 12-20, 2021

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.174** | **CR** | **Draft** | **rev** |  | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *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 | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR to introduce test cases for BFD and LR based on SSB in FR2 for IAB | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IAB-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***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:*** | | Test cases for beam failure detection and link recovery with SSB in FR2 need to be added based on the agreed test cases list in R4-2104091 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The changes are based on the endorsed CR R4-2103545. The new changes are proposed using “additional changes for RAN4#98-bis-e”  Introduce test cases for beam failure detection and link recovery with SSB in FR2 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The test cases are missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | G.2.3.2.X | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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>

#### G.2.3.2.X Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR

##### G.2.3.2.X.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-MT active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 12.3.2.2.

The test parameters are given in Tables G.2.3.2.X.1-1, G.2.3.2.X.1-2, G.2.3.2.X.1-3 and G.2.3.2.X.1-4 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.X.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.X.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. In the test, DRX configuration is not enabled.

Table G.2.3.2.X.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The IAB-MT is only required to pass in one of the supported test configurations in FR2 | |

Table G.2.3.2.X.1-2: General test parameters for FR2 PCell for SSB-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 |  |
| BWchannel | | Config 1, 2 | | |  | 100: NRB,c = 66 |  |
| 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, 2 | | |  | CR. 3.1 TDD |  |
| SSB Configuration | | Config 1 | | |  | SSB.1 FR2 |  |
|  | | Config 2 | | |  | SSB.2 FR2 |  |
| SMTC Configuration | | Config 1, 2 | | |  | SMTC.3 |  |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | |  | 120 KHz |  |
| SSB index assigned as BFD RS (q0) | | | | |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | | | |  | 1 |  |
| OCNG parameters | | | | |  | OP.1 |  |
| CP length | | | | |  | Normal |  |
| 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 |  |
| DRX | | | | |  | OFF |  |
| rlmInSyncOutOfSyncThreshold | | | | |  | absent | When the field is absent, the IAB-MT applies the value 0. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp- | | | Config 1 | | dBm/SSB | -94.5 | Threshold used |
| ThresholdSSB | | | Config 2 | | SCS | -91.5 | for Qin\_LR\_SSB |
| powerControlOffsetSS | | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | |  | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer | | | | |  | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| CSI-RS configuration for CSI reporting | | | | Config 1, 2 |  | CSI-RS.3.1 TDD |  |
| TCI states | | | | |  | TCI.State.0 |  |
| CSI-RS for tracking | | | | Config 1, 2 |  | TRS.2.1 TDD |  |
| SSB index assigned as RLM RS | | | | |  | 0, 1 |  |
| T310 Timer | | | | | ms | 1000 |  |
| N310 | | | | |  | 2 |  |
| T1 | | | | | s | 1 | During this time the the IAB-MT shall be fully synchronized to cell 1 |
| T2 | | | | | s | 2.61 |  |
| T3 | | | | | s | 1.64 |  |
| T4 | | | | | s | 0 |  |
| T5 | | | | | s | 1.01 |  |
| D1 | | | | | s | 0.97 |  |
| 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. | | | | | | | |

*Editor’s note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.*

Table G.2.3.2.X.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in G.1.18 | | | | |
| 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 | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
|  | Config 2 |  | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1 | dBm/SSB | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 2 | SCS | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1 | dBm/120 KHz | -104.7 | | | | |
|  | Config 2 |  | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| 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.X.1-1.  Note 9: The SNR values are specified for testing an IAB-MT which supports 2RX on at least one band. For testing of an IAB-MT hich supports 4RX on all bands, the SNR during T3 is modified as specified in clause G.1.3. 1 | | | | | | | |

**Table G.2.3.2.X.1-4: Void**

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**Figure G.2.3.2.X.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### G.2.3.2.X.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.

During the period from time point A to time point B the IAB-MT shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the IAB-MT shall detect beam failure and initiate link recovery. During T4 and T5 the IAB-MT measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 560+650 ms after the start of T5, the IAB-MT shall transmit preamble on a beam associated with the candidate beam set q1. The IAB-MT shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the IAB-MT. The rate of correct events observed during repeated tests shall be at least 90%.

### <End of Change 1>