**3GPP TSG- Meeting #**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | 2 | **Current version:** |  |  |
|  |
| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
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| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | RAN4 had defined core requirements for TRP specifi BFR and agreed to introduce corresponding test cases. |
|  |  |
| ***Summary of change:*** | Introduced test case for TRP Specific Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode |
|  |  |
| ***Consequences if not approved:*** | Test case to verify CSI-RS based TRP specific BFR in DRX mode for FR1 in SA mode will not be verified. |
|  |  |
| ***Clauses affected:*** | A.6.5 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS 38.533  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*-----------------Change 1---------------------*

####

#### A.6.5.X TRP Specific Beam Failure Detection and Link recovery procedures

#### A.6.5.X.1 TRP Specific Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode

##### A.6.5.X.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure in the sets q0,0  and q0,1  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1,0 andq1,1. The purpose is to test the downlink monitoring for beam failure detection on TRP1 within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based TRP specific beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.18.

The test parameters are given in Tables A.6.5.X.1.1-1, A.6.5.X.1.1-2, A.6.5.X.1.1-3, and A.6.5.X.1.1-4 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 A.6.5.X.1.1-1 shows the variation of the downlink SNR of the CSI-RS in set q0,0  and q0,1  for TRP1 and TRP2 respectively to emulate CSI-RS based beam failure on TRP1. Figure A.6.5.X.1.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q1,0 andq1,1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.6.5.X.1.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 |

Table A.6.5.X.1.1-2: General test parameters for FR1 PCell for CSI-RS-based TRP specific beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | Value | Comment |
|  |  | TRP1 | TRP2 |  |
| Active PCell  |  | Cell 1 | Cell 1 |  |
| RF Channel Number |  | 1 | 1 |  |
| Duplex mode | Config 1 |  | FDD | FDD |  |
|  | Config 2, 3 |  | TDD | TDD |  |
| TDD Configuration | Config 1 |  | Not Applicable | Not Applicable |  |
|  | Config 2 |  | TDDConf.1.1 | TDDConf.1.1 |  |
|  | Config 3 |  | TDDConf.2.1 | TDDConf.2.1 |  |
| RMSI CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | CR.1.1 FDD | A.3.1.2 |
|  | Config 2 |  | CR.1.1 TDD | CR.1.1 TDD |  |
|  | Config 3 |  | CR.2.1 TDD | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD | CCR.1.1 FDD | A.3.1.3 |
|  | Config 2 |  | CCR.1.1 TDD | CCR.1.1 TDD |  |
|  | Config 3 |  | CCR.2.1 TDD | CCR.2.1 TDD |  |
| SSB Configuration | Config 1 |  | SSB. 3 FR1 | SSB. 3 FR1 | A.3.10 |
|  | Config 2 |  | SSB. 3 FR1 | SSB. 3 FR1 |
|  | Config 3 |  | SSB. 4 FR1 | SSB. 4 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 | SMTC.1 | A.3.11 |
|  | Config 3 |  | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 KHz | 15 KHz |  |
|  | Config 3 |  | 30 KHz | 30 KHz |  |
| PRACH Configuration | Config 1, 2 |  | FR1 PRACH configuration 4 | FR1 PRACH configuration 4 | A.3.8.2 |
| Config 3 |  | FR1 PRACH configuration 4 | FR1 PRACH configuration 4 | A.3.8.2 |
| OCNG parameters |  | OP.1 | OP.1 | A.3.2.1 |
| CP length  |  | Normal | Normal |  |
| Correlation Matrix and Antenna Configuration |  | 2x2 Low | 2x2 Low |  |
| Beam failure detection transmission parameters  | DCI format |  | 1-0 | 1-0 |  |
|  | Number of Control OFDM symbols |  | 2 | 2 |  |
|  | Aggregation level  | CCE | 8 | 8 |  |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | 0 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | 0 |  |
|  | DMRS precoder granularity |  | REG bundle size | REG bundle size |  |
|  | REG bundle size |  | 6 | 6 |  |
| DRX |  | DRX.7 | DRX.7 | A.3.3.7 |
| Gap pattern ID  |  | N.A. | N.A. |  |
| rlmInSyncOutOfSyncThreshold |  | absent | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/SCS kHz | -98 |  | Threshold used for Qin\_LR\_SSB |
| Config 3 |  | -95 |  |  |
| powerControlOffsetSS |  | db0 | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount |  | n1 | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer |  | pbfd4 | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| CSI-RS configuration for BFD/CBD/RLM | Config 1 |  | CSI-RS.1.2 FDD | CSI-RS.1.7 FDD | A.3.14.1 |
| Config 2 |  | CSI-RS.1.2 TDD | CSI-RS.1.6 TDD |  |
| Config 3 |  | CSI-RS.2.2 TDD | CSI-RS.2.7 TDD |  |
| CSI-RS index assigned as BFD RS  |  | 0 | 2 |  |
| CSI-RS index assigned as CBD RS  |  | 1 | 3 |  |
| CSI-RS index assigned as RLM RS |  | 0,1 | 0,1 |  |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD | CSI-RS.1.1 FDD | A.3.14.1 |
| Config 2 |  | CSI-RS.1.1 TDD | CSI-RS.1.1 TDD |  |
| Config 3 |  | CSI-RS.2.1 TDD | CSI-RS.2.1 TDD |  |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | TRS.1.1 FDD |  |
| Config 2 |  | TRS.1.1 TDD | TRS.1.1 TDD |  |
| Config 3 |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| CSI-RS-Index assigned as RLM RS | Config 1 |  | CSI-RS.1.2 FDD | CSI-RS.1.2 FDD |  |
| Config 2 |  | CSI-RS.1.2 TDD | CSI-RS.1.2 TDD |  |
| Config 3 |  | CSI-RS.2.2 TDD | CSI-RS.2.2 TDD |  |
| T310 Timer | ms | 1000 | 1000 |  |
| N310 |  | 2 | 2 |  |
| T1 | s | 1 | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | s | [10.81] | [10.81] |  |
| T3 | s | [10.28] | [10.28] |  |
| T4 | s | 0 | 0 |  |
| T5 | s | [0.57] | [0.57] |  |
| D1 | s | [0.53] | [0.53] |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |

Table A.6.5.X.1.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

|  |  |  |
| --- | --- | --- |
| 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 q0,0 | Config 1 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q0,1 | Config 1 | dB | 5 | 5 | 5 | 5 | 5 |
|  | Config 2 |  | 5 | 5 | 5 | 5 | 5 |
|  | Config 3 |  | 5 | 5 | 5 | 5 | 5 |
| SNR\_CSI-RS of set q1,0 | 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 |
|  | Config 3 |  | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS\_RP of set q1,0 | Config 1 | dB/SCS kHz | -110 | -110 | -88 | -88 | -88 |
|  | Config 2 |  | -110 | -110 | -88 | -88 | -88 |
|  | Config 3 |  | -107 | -107 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 KHz | -98 |
|  | Config 2 |  | -98 |
|  | Config 3 |  | -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 UE prior to the start of time period T1.Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE 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 UEs 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 A.4.5.5.1.1-1.Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6. |



**Figure A.6.5.X.1.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

##### A.6.5.X.1.2 Test Requirements

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

During the time duration T1 and T2, the UE 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 UE 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 UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1,0.

No later than time point F occurring no later than D1 = 1920+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1,0. The UE shall not transmit preamble on a beam associated with the candidate beam set q1,0 earlier than time point B.

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