3GPP TSG-RAN WG4 Meeting # 111 R4-2407182

Fukuoka , JP, 20 May – 24 May 2024

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| --- |
| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | 4323 | **rev** | 1 | **Current version:** | **15.25.0** |  |
|  |
| *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:***  | (NR\_newRAT-Perf) CR on test for scheduling availability during BFD/CBD in FR2 |
|  |  |
| ***Source to WG:*** | MediaTek inc. |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Perf |  | ***Date:*** | 2024-05-20 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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:*** | BFD-RS is not updated after Beam Recovery during the test, so the RACH process is constantly triggered by the BFD-RS with low SNR condition and thus it cannot verify the test requirement during T5.  |
|  |  |
| ***Summary of change:*** | Update BFD-RS to be changed after TE received the RACH preamble |
|  |  |
| ***Consequences if not approved:*** | Test may not be completed as the RACH process is constantly triggered |
|  |  |
| ***Clauses affected:*** | A.5.5.5.5, A.7.5.5.5 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.533 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

### <Start of Change>

#### A.5.5.5.5 EN-DC scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

##### A.5.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.5.5.5.5.1-1, A.5.5.5.5.1-2 and A.5.5.5.5.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.5.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB index 0 in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.5.1-2 shows the variation of the downlink L1-RSRP of the SSB index 1 used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

**Table A.5.5.5.5.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |

**Table A.5.5.5.5.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Test****Config.** | **Unit** | **Value** | **Comment** |
|  |  |  | **Test 1** |  |
| Active E-UTRA PCell | 1-4 |  | Cell 1 |  |
| E-UTRA RF Channel Number | 1-4 |  | 1 |  |
| Active PCell  | 1-4 |  | Cell 2 |  |
| RF Channel Number | 1-4 |  | 2 |  |
| Duplex mode | 1-4 |  | TDD |  |
| TDD Configuration | 1-4 |  | TDDConf.3.1 |  |
| BWchannel | 1-4 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | 1-4 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | 1-4 | kHz | 120 |  |
| DL initial BWP configuration | 1-4 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | 1-4 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | 1-4 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | 1-4 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | 1-2 |  | SR.3.2 TDD |  |
| 3-4 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | 1-2 |  | CR.3.1 TDD |  |
| 3-4 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | 1-2 |  | CCR.3.1 TDD |  |
| 3-4 | CCR.3.7 TDD |  |
| OCNG parameters | 1-4 |  | OP.1 |  |
| CP length | 1-4 |  | Normal |  |
| PDSCH/PDCCH TCI state | 1-4 |  | TCI.State.0 |  |
| CSI-RS for tracking | 1-4 |  | TRS.2.1 TDD |  |
| SSB Configuration | 1-2 |  | SSB.1 FR2 |  |
| 3-4 | SSB.2 FR2 |  |
| SMTC Configuration | 1-4 |  | SMTC.1 |  |
| PRACH Configuration | 1-4 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | 1-4 |  | OFF |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Beam failure detection transmission parameters | DCI format | 1-4 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-4 |  | 2 |  |
| Aggregation level  | 1-4 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 |  |
| DMRS precoder granularity | 1-4 |  | REG bundle size |  |
| REG bundle size | 1-4 |  | 6 |  |
| Gap pattern ID | 1-4 |  | N/A | No measurement gap is configured |
| rlmInSyncOutOfSyncThreshold | 1-4 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | 1-2 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 3-4 | -92 |
| powerControlOffsetSS | 1-4 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1-4 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | 1-4 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1-4 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | 1-4 |  | periodic |  |
| reportQuantity | 1-4 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | 1-4 | slot | 40 |  |
| CSI reporting offset | 1-4 | slot | 4 |  |
| T310 | 1-4 | ms | 1000 |  |
| N310 | 1-4 |  | 2 |  |
| T1 | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-4 | s | 2.6 |  |
| T3 | 1-4 | s | 1.64 |  |
| T4 | 1-4 | s | 0 |  |
| T5 | 1-4 | s | 1.01 |  |
| D1 | 1-4 | s | 0.97 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.Note 2: UE-specific PDCCH is not transmitted after T1 starts. |

**Table A.5.5.5.5.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup |  | Setup 1 defined in A.3.15 |
| Assumption for UE beamsNote 10 |  | Rough |
| 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 |  |
| SSB index assigned as BFD RS (q0) | Config 1-4 |  | 0 | 0 | Note 12 |
| SSB index assigned as CBD RS (q1) | Config 1-4 |  | 1 | 1 | 1 | 1 | 1 |
| SNR of SSB index 0 | Config 1-4 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR of SSB index 1 | Config 1-4 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of SSB index 1 | Config 1-2 | dBm/ | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 3-4 | SCS | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-4 | dBm/120 kHz | -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 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 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 A.5.5.5.5.1-1.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.Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementationNote 11: This value allows up to 1dB degradation from applied SNR to UE basebandNote 12: BFD RS (q0) is configured as SSB index 0 at the start of T3 and, and it is reconfigured by RRC as SSB index 1 after the UE transmits the preamble on a beam associated with the candidate beam set q1. |



**Figure A.5.5.5.5.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**



Figure A.5.5.5.5.1-2: SSB\_RP level variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.5.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

* The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

* The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

### <Next Change>

#### A.7.5.5.5 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.7.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.7.5.5.5.1-1, A.7.5.5.5.1-2 and A.7.5.5.5.1-3 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 A.7.5.5.5.1-1 shows the variation of the downlink SNR of the SSB index 0 in the active cell to emulate SSB based beam failure. Figure A.7.5.5.5.1-2 shows the variation of the downlink L1-RSRP of the SSB index 1 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 5ms. This test will focus on the scheduling availability during beam failure detection) and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

**Table A.7.5.5.5.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |

**Table A.7.5.5.5.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Test****Config.** | **Unit** | **Value** | **Comment** |
|  |  |  | **Test 1** |  |
| Active PCell  | 1-2 |  | Cell 1 |  |
| RF Channel Number | 1-2 |  | 1 |  |
| Duplex mode | 1-2 |  | TDD |  |
| TDD Configuration | 1-2 |  | TDDConf.3.1 |  |
| BWchannel | 1-2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | 1-2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | 1-2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | 1-2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | 1-2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | 1 |  | SR.3.2 TDD |  |
| 2 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |  |
| 2 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |  |
| 2 | CCR.3.7 TDD |  |
| OCNG parameters | 1-2 |  | OP.1 |  |
| CP length | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | 1-2 |  | TCI.State.0 |  |
| CSI-RS for tracking | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | 1 |  | SSB.1 FR2 |  |
| 2 | SSB.2 FR2 |  |
| SMTC Configuration | 1-2 |  | SMTC.1 |  |
| PRACH Configuration | 1-2 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | 1-2 |  | OFF |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level  | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | 1-2 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | 1 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 2 | -92 |
| powerControlOffsetSS | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1-2 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | 1-2 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1-2 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | 1-2 |  | periodic |  |
| reportQuantity | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | 1-2 | slot | 40 |  |
| CSI reporting offset | 1-2 | slot | 4 |  |
| T310 | 1-2 | ms | 1000 |  |
| N310 | 1-2 |  | 2 |  |
| T1 | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-2 | s | 2.6 |  |
| T3 | 1-2 | s | 1.64 |  |
| T4 | 1-2 | s | 0 |  |
| T5 | 1-2 | s | 1.01 |  |
| D1 | 1-2 | s | 0.97 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.Note 2: UE-specific PDCCH is not transmitted after T1 starts. |

**Table A.7.5.5.5.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  |  | T1 | T2 | T3 | T4 | T5 |
| AoA Setup |  | Setup1 defined in A.3.15.1 |
| Assumption for UE beams Note 10 |  | Rough |
| 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 |  |
| SSB index assigned as BFD RS (q0) | Config 1-4 |  | 0 | 0 | Note 12 |
| SSB index assigned as CBD RS (q1) | Config 1-4 |  | 1 | 1 | 1 | 1 | 1 |
|  SNR of SSB index 0 | Config 1-2 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
|  SNR of SSB index 1 | Config 1-2 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of SSB index 1 | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| Config 2 | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-2 | dBm/120 kHz | -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 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 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 A.7.5.5.5.1-1.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.Note 10: Information about types of UE beam given in B.2.1.3 and does not limit UE implementation or test system implementationNote 11: This value allows up to 1dB degradation from applied SNR to UE baseband.Note 12: BFD RS (q0) is configured as SSB index 0 at the start of T3 and, and it is reconfigured by RRC as SSB index 1 after the UE transmits the preamble on a beam associated with the candidate beam set q1. |



Figure A.7.5.5.5.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode



Figure A.7.5.5.5.1-2: SSB\_RP level variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.7.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

### <End of Change>