**3GPP TSG- RAN4 Meeting # 111 *R4-2408541***

**, Japan, -**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **4486** | **rev** | **-** | **Current version:** | **17.13.0** |  |
|  | | | | | | | | |
| *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\_RF\_FR1\_enh-Perf) Correction to Rel-17 Tx switching RRM test cases\_R17 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RF\_FR1\_enh-Perf | | | | |  | ***Date:*** | | | 2024-05-13 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR is to solve following issues in Rel-17 Tx switching test cases.   1. SRS configurations and AP CSI-RS configurations needs to be updated as explained in corresponding discussion paper R4-2408547. 2. Brackets are removed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Issues mentioned above are fixed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Rel-17 DL interruptions at Tx switching are not correct. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.6.5.7B.1, A.6.5.7B.2, A.6.5.7C.1, A.6.5.7C.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 1>

### A.6.5.7B DL interruptions at switching between one uplink band with one transmit antenna connector and one uplink band with two transmit antenna connectors

#### A.6.5.7B.1 DL interruptions at switching between two uplink bands in FDD-TDD CA

##### A.6.5.7B.1.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands defined in clause 8.2.2.2.10B. The test case is applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, where NR UL carrier 1 in band A is capable of one transmit antenna connector, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies.

There are three cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3) where cell 1 in band A is with 1TX, cell2 and cell 3 in band B with 2Tx, cell2 and cell3 are two contiguous aggregated carriers. The test parameters for the three cells are given in Table A.6.5.7B.1.1-1, Table A.6.5.7B.1.1-2 and Table A.6.5.7B.1.1-3 below.

For NR FDD carrier (Cell 1), aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on the following symbol in the slot overlapping with the 1st special slot of every radio frame of the NR TDD carrier (Cell 2):

- symbol#12 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,

- symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 210us or

- symbol #9 if UE capability *uplinkTxSwitchingPeriod* is 140us or

- symbol #10 if UE capability *uplinkTxSwitchingPeriod* is 35us.

For NR TDD Cell 2 and NR TDD Cell 3, aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting 6dB on the following symbol in the 2nd special slot of every radio frame:

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,

- symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or

- symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or

- symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

This test verifies that the UE correctly report the L1-RSRP reporting. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *uplinkTxSwitching* is indicated to UE.

Table A.6.5.7B.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.6.5.7B.1.1-2: General test parameters for DL interruptions at switching between two uplink bands in FDD-TDD CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell |  | Config 1 | Cell 1: FR1 PCell  Cell 2: FR1 SCell  Cell 3: FR1 SCell | Cell1: FR1 PCell on RF channel number 1 in band A  Cell 2: FR1 SCell on RF channel number 2 in band B  Cell 3: FR1 SCell on RF channel number 3 in band B  Note: Cell 2 and Cell 3 are two contiguous aggregated carriers |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | OFF |  |
| Measurement gap pattern Id |  | Config 1 | OFF |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting |  | Config 1 | Cell 1: CSI-RS.1.5 FDD  Cell 2: CSI-RS.2.5 TDD  Cell 3: CSI-RS.2.5 TDD |  |
| T1 | s | Config 1 | 5 |  |

Table A.6.5.7B.1.1-3: Cell specific test parameters for DL interruptions at switching between two uplink bands in FDD-TDD CA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell1 | Cell2 | Cell3 |
| Frequency Range | | |  | FR1 | FR1 | FR1 |
| Duplex mode | | Config 1 |  | FDD | TDD | TDD |
| TDD configuration | | Config 1 |  | N/A | TDDConf.2.1 except that:  S=’11DL: 1GP:2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* | TDDConf.2.1 except that:  S=’11DL: 1GP:2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* |
| BWchannel | | Config 1 |  | 10 MHz: NRB,c = 52 | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 |  | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | | Config 1 |  | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl10,6 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1 |  | CR.1.1 FDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1 |  | CCR.1.1 FDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | |  | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | |  | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | |  | SSB.1 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | |  | 1x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |
| NocNote 2 | | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | | dBm/SCS | -87 | -87 | -87 |
| Ês/Iot | | | dB | 17 | 14 | 14 |
| Ês/Noc | | | dB | 17 | 14 | 14 |
| NocNote 2 | Config 1 | | dBm/SCS | -104 | -101 | -101 |
| IoNote3 | Config 1 | | dBm/9.36 MHz | -58.96 | - | - |
|  |  | | dBm/  38.16MHz | - | -55.79 | -55.79 |
| Time offset to Cell1 Note 5 | | | μs | - | 0 | 0 |
| Propagation Condition | | |  | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | | | |

##### A.6.5.7B.1.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10B.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.2.

The rate of correct events observed during repeated tests shall be at least 90%.

#### A.6.5.7B.2 DL interruptions at switching between two uplink bands in TDD-TDD CA

##### A.6.5.7B.2.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands defined in clause 8.2.2.2.10B. The test case is applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, where NR UL carrier 1 in band A is capable of one transmit antenna connector, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies.

There are three cells: FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3) where cell 1 in band A is with 1TX, cell2 and cell 3 in band B with 2Tx, cell2 and cell3 are two contiguous aggregated carriers.The test parameters for the three cells are given in Table A.6.5.7B.2.1-1, Table A.6.5.7B.2.1-2 and Table A.6.5.7B.2.1-3 below.

For NR TDD PCell (Cell 1), aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on the following symbol in the 1st special slot of every radio frame:

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,

- symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or

- symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or

- symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

For NR TDD Cell 2 and NR TDD Cell 3, aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting 6dB on the following symbol on the 2nd special slot of every radio frame:

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,

- symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or

- symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or

- symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

This test verifies that the UE correctly report the L1-RSRP reporting. The test case is only applicable to UE which supports *simultaneousRxTxInterBandCA.*

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *uplinkTxSwitching* is indicated to UE.

Table A.6.5.7B.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.6.5.7B.2.1-2: General test parameters for DL interruptions at switching between two uplink bands in TDD-TDD CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2, 3 | Two radio channels are used for this test. |
| Active cell |  | Config 1 | Cell 1: FR1 PCell  Cell 2: FR1 SCell  Cell 3: FR1 SCell | Cell1: FR1 PCell on RF channel number 1 in band A  Cell 2: FR1 SCell on RF channel number 2 in band B  Cell 3: FR1 SCell on RF channel number 3 in band B  Note: Cell 2 and Cell 3 are two contiguous aggregated carriers |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | OFF |  |
| Measurement gap pattern Id |  | Config 1 | OFF |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting |  | Config 1 | Cell 1: CSI-RS.2.5 TDD  Cell 2: CSI-RS.2.5 TDD  Cell 3: CSI-RS.2.5 TDD |  |
| T1 | s | Config 1 | 5 |  |

Table A.6.5.7B.2.1-3: Cell specific test parameters for DL interruptions at switching between two uplink bands in TDD-TDD CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell1 | Cell2 | Cell3 |
| Frequency Range | |  | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 |  | TDD | TDD | TDD |
| TDD configuration | Config 1 |  | TDDConf.2.1 except that  S=’1 1DL: :2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* | TDDConf.2.2 | TDDConf.2.2 |
| BWchannel | Config 1 |  | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 |  | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,5 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 |
| PDSCH Reference measurement channel | Config 1 |  | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 |  | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | |  | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  |  |
| NocNote 2 | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -84 | -87 | -87 |
| Ês/Iot | | dB | 17 | 14 | 14 |
| Ês/Noc | | dB | 17 | 14 | 14 |
| NocNote 2 | Config 1 | dBm/SCS | -101 | -101 | -101 |
| IoNote3 | Config 1 |  |  | - | - |
|  |  | dBm/  38.16MHz | - 55.79 | -55.79 | -55.79 |
| Time offset to Cell1 Note 5 | | μs | - | 0 | 0 |
| Propagation Condition | |  | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | | |

##### A.6.5.7B.2.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10B.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.2.

The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.7C DL interruptions at switching between two uplink bands with two transmit antenna connectors

#### A.6.5.7C.1 DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA

##### A.6.5.7C.1.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands with two transmit antenna connectors defined in clause 8.2.2.2.10C. The test case is applicable for an uplink band pair of an inter-band FDD-TDD CA configuration when the capability *[uplinkTxSwitchingPeriod2T2T]* is present, where NR UL carrier 1 in band A is capable of two transmit antenna connector, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies.

There are three cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3) where cell 1 in band A is with 2Tx, cell2 and cell 3 in band B with 2Tx, cell2 and cell3 are two contiguous aggregated carriers. The test parameters for the three cells are given in Table A.6.5.7C.1.1-1, Table A.6.5.7C.1.1-2 and Table A.6.5.7C.1.1-3 below.

For NR FDD carrier (Cell 1), aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on the following symbol in the slot overlapping with the 1st special slot of every radio frame of the NR TDD carrier (Cell 2) and NR TDD carrier (Cell 3):

- symbol#12 if UE does not report uplinkTxSwitching-DL-Interruption;

- otherwise,

- symbol #8 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 210us or

- symbol #9 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 140us or

- symbol #10 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 35us.

For NR TDD carrier (Cell 2) and NR TDD carrier (Cell 3), aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting 6dB on the following symbol in the 2nd special slot of every radio frame:

- symbol#10 if UE does not report [uplinkTxSwitching-DL-Interruption];

- otherwise,

- symbol #4 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 210us or

- symbol #5 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 140us or

- symbol #8 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 35us.

This test verifies that the UE correctly report the L1-RSRP reporting. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *[uplinkTxSwitchingPeriod2T2T]* is indicated to UE.

Table A.6.5.7C.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.6.5.7C.1.1-2: General test parameters for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| RF Channel Number |  | Config 1 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell |  | Config 1 | Cell 1: FR1 PCell  Cell 2: FR1 SCell  Cell 3: FR1 SCell | FR1 PCell on RF channel number 1  FR1 SCell on RF channel number 2  FR1 SCell on RF channel number 3 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | OFF |  |
| Measurement gap pattern Id |  | Config 1 | OFF |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting |  | Config 1 | Cell 1: CSI-RS.1.5 FDD  Cell 2: CSI-RS.2.5 TDD  Cell 3: CSI-RS.2.5 TDD |  |
| T1 | s | Config 1 | 5 |  |

Table A.6.5.7C.1.1-3: Cell specific test parameters for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell1 | Cell2 | Cell3 |
| Frequency Range | |  | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 |  | FDD | TDD | TDD |
| TDD configuration | Config 1 |  | N/A | TDDConf.2.1 except that:  S=’11DL: 1GP:2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* | TDDConf.2.1 except that:  S=’11DL: 1GP:2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* |
| BWchannel | Config 1 |  | 10 MHz: NRB,c = 52 | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 |  | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl10,6 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 |  | CR.1.1 FDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.1.1 FDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | |  | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.1 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  |  |
| NocNote 2 | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -87 | -87 | -87 |
| Ês/Iot | | dB | 17 | 14 | 14 |
| Ês/Noc | | dB | 17 | 14 | 14 |
| NocNote 2 | Config 1 | dBm/SCS | -104 | -101 | -101 |
| IoNote3 | Config 1 | dBm/9.36 MHz | -58.96 | - | - |
|  |  | dBm/  38.16MHz | - | -55.79 | -55.79 |
| Time offset to Cell1 Note 5 | | μs | - | 0 | 0 |
| Propagation Condition | |  | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | | |

##### A.6.5.7C.1.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10C.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.2.

The rate of correct events observed during repeated tests shall be at least 90%.

#### A.6.5.7C.2 DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA

##### A.6.5.7C.2.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers defined in clause 8.2.2.2.10C. The test case is applicable for an uplink band pair of an inter-band TDD-TDD CA configuration when the capability *[uplinkTxSwitchingPeriod2T2T]* is present, , where NR UL carrier 1 in band A is capable of two transmit antenna connector, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies.

There are three cells: FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3) where cell 1 in band A is with 2Tx, cell2 and cell 3 in band B with 2Tx, cell2 and cell3 are two contiguous aggregated carriers. The test parameters for the three cells are given in Table A.6.5.7C.2.1-1, Table A.6.5.7C.2.1-2 and Table A.6.5.7C.2.1-3 below.

For NR TDD PCell (Cell 1), aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on the following symbol in the 1st special slot of every radio frame:

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption;

- otherwise,

- symbol #4 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 210us or

- symbol #5 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 140us or

- symbol #8 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 35us.

For NR TDD SCell (Cell 2) and NR TDD SCell (Cell 3), aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting [6dB] on the following symbol on the 2nd special slot of every radio frame:

- symbol#10 if UE does not report [uplinkTxSwitching-DL-Interruption];

- otherwise,

- symbol #4 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 210us or

- symbol #5 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 140us or

- symbol #8 if UE capability *[uplinkTxSwitchingPeriod2T2T]* is 35us.

This test verifies that the UE correctly report the L1-RSRP reporting. The test case is only applicable to UE which supports *simultaneousRxTxInterBandCA.*

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *[uplinkTxSwitchingPeriod2T2T]* is indicated to UE.

Table A.6.5.7C.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.6.5.7C.2.1-2: General test parameters for DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell |  | Config 1 | Cell 1: FR1 PCell  Cell 2: FR1 SCell  Cell 3: FR1 SCell | FR1 PCell on RF channel number 1  FR1 SCell on RF channel number 2  FR1 SCell on RF channel number 3 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | OFF |  |
| Measurement gap pattern Id |  | Config 1 | OFF |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting |  | Config 1 | Cell 1: CSI-RS.2.5 TDD  Cell 2: CSI-RS.2.5 TDD  Cell 3: CSI-RS.2.5 TDD |  |
| T1 | s | Config 1 | 5 |  |

Table A.6.5.7C.2.1-3: Cell specific test parameters for DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell1 | Cell2 | Cell3 |
| Frequency Range | |  | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 |  | TDD | TDD | TDD |
| TDD configuration | Config 1 |  | TDDConf.2.1 except that  S=’1 1DL: :2UL’;  *nrofDownlinkSymbols: 11*  *nrofUplinkSymbols: 2* | TDDConf.2.2 | TDDConf.2.2 |
| BWchannel | Config 1 |  | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 |  | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,5 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:  resourceMappingstartPosition: 0  resourceMappingnrofSymbols: n2  periodicityAndOffset-p: sl20,3 |
| PDSCH Reference measurement channel | Config 1 |  | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 |  | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | |  | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  |  |
| NocNote 2 | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -84 | -87 | -87 |
| Ês/Iot | | dB | 17 | 14 | 14 |
| Ês/Noc | | dB | 17 | 14 | 14 |
| NocNote 2 | Config 1 | dBm/SCS | -101 | -101 | -101 |
| IoNote3 | Config 1 |  |  | - | - |
|  |  | dBm/  38.16MHz | -55.79 | -55.79 | -55.79 |
| Time offset to Cell1 Note 5 | | μs | - | 0 | 0 |
| Propagation Condition | |  | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | | |

##### A.6.5.7C.2.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10C.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.2.

The rate of correct events observed during repeated tests shall be at least 90%.

<End of Change 1>