**3GPP TSG-RAN4 Meeting #97-e *R4-2017172***

**Electronic Meeting, Nov 2 – 13, 2020**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **1410** | **rev** | **-** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *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:*** | Big CR: Introduction of Rel-16 NR FR1 RF WI RRM performance requirements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RF\_FR1-Perf | | | | |  | ***Date:*** | | | 2020-11-16 |
|  |  | | | |  | |  | | |  |
| ***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 DL Interruptions at UE switching between two uplink carries shall be specified. The big CR is to merge the below endorsed draftCRs which were endorsed in RAN4#97e:  -R4-2017324 Draft CR to TS 38.133: Test case for DL interruptions at UE switching between two uplink carriers in FDD+TDD inter-band CA case  -R4-2017346 Draft CR to TS 38.133: Test case for DL interruptions at UE switching between two uplink carriers in TDD+TDD inter-band CA case  -R4-2017326 Test case for DL Interruptions at UE switching between LTE 1Tx carrier and NR 2Tx carrier in inter-band ENDC | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1.Define test case for DL Interruptions at UE switching between two uplink carries. The big CR is to merge the below endorsed draftCRs which were endorsed in RAN4#97e:  -R4-2017324 Draft CR to TS 38.133: Test case for DL interruptions at UE switching between two uplink carriers in FDD+TDD inter-band CA case  -R4-2017346 Draft CR to TS 38.133: Test case for DL interruptions at UE switching between two uplink carriers in TDD+TDD inter-band CA case  -R4-2017326 Test case for DL Interruptions at UE switching between LTE 1Tx carrier and NR 2Tx carrier in inter-band ENDC  2. Rerange the section number of R4-2017346.Some editorial changes with change mark are made as well. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The specification is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.3.1.4; A.3.14; A.4.5.8; A.6.5.X.1; A.6.5.X.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:*** | |  | | | | | | | | |

----------------------------------------------------- Beginning of Change 1 ------------------------------------------------------------

### A.3.1.4 TDD UL/DL configuration

Table A.3.1.4-1: TDD UL/DL configuration for SCS=15kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.1.1 |  |  |
| *referenceSubcarrierSpacing* | kHz | 15 |  |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DSUU’  S=’10DL:2GP:2UL’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 4 |  |  |
| *nrofDownlinkSlots* |  | 1 |  |  |
| *nrofDownlinkSymbols* |  | 10 |  |  |
| *nrofUplinkSlot* |  | 2 |  |  |
| *nrofUplinkSymbols* |  | 2 |  |  |
| TDD UL/DL pattern 2 Note 2 |  | ‘D’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 1 |  |  |
| *nrofDownlinkSlots* |  | 1 |  |  |
| *nrofDownlinkSymbols* |  | 0 |  |  |
| *nrofUplinkSlot* |  | 0 |  |  |
| *nrofUplinkSymbols* |  | 0 |  |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

Table A.3.1.4-2: TDD UL/DL configuration for SCS=30kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.2.1 | TDDConf.2.2 |  |
| *referenceSubcarrierSpacing* | kHz | 30 | 30 |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘3D1S4U’  S=’6DL:4GP:4UL’ | ‘1D1S2U’  S=’10DL:2GP:2UL’ |  |
| *dl-UL-TransmissionPeriodicity* | ms | 4 | 2 |  |
| *nrofDownlinkSlots* |  | 3 | 1 |  |
| *nrofDownlinkSymbols* |  | 6 | 10 |  |
| *nrofUplinkSlot* |  | 4 | 2 |  |
| *nrofUplinkSymbols* |  | 4 | 2 |  |
| TDD UL/DL pattern 2 Note 2 |  | ‘DD’ | Not configured |  |
| *dl-UL-TransmissionPeriodicity* | ms | 1 | Not configured |  |
| *nrofDownlinkSlots* |  | 2 | Not configured |  |
| *nrofDownlinkSymbols* |  | 0 | Not configured |  |
| *nrofUplinkSlot* |  | 0 | Not configured |  |
| *nrofUplinkSymbols* |  | 0 | Not configured |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

Table A.3.1.4-3: TDD UL/DL configuration for SCS=120kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.3.1 |  |  |
| *referenceSubcarrierSpacing* | kHz | 120 |  |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DDDSU’  S=’10DL:2GP:2UL’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 0.625 |  |  |
| *nrofDownlinkSlots* |  | 3 |  |  |
| *nrofDownlinkSymbols* |  | 10 |  |  |
| *nrofUplinkSlot* |  | 1 |  |  |
| *nrofUplinkSymbols* |  | 2 |  |  |
| TDD UL/DL pattern 2 Note 2 |  | Not configured |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | Not configured |  |  |
| *nrofDownlinkSlots* |  | Not configured |  |  |
| *nrofDownlinkSymbols* |  | Not configured |  |  |
| *nrofUplinkSlot* |  | Not configured |  |  |
| *nrofUplinkSymbols* |  | Not configured |  |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

----------------------------------------------------- End of Change 1 ------------------------------------------------------------

----------------------------------------------------- Beginning of Change 2 ------------------------------------------------------------

## A.3.14 CSI-RS configurations

### A.3.14.1 FDD

Table A.3.14.1-1: CSI-RS Reference Measurement Channels for SCS=15kHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | CSI-RS.1.1 FDD | CSI-RS.1.2 FDD | CSI-RS.1.3 FDD | CSI-RS.1.4 FDD | CSI-RS.1.5 FDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic | aperiodic |
| Resource Set Config |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 6 | 6 | 6 |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 1 for resource #1 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. | n.a. |
| Offset | 1 | 1 | n.a. | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | n.a. |
| TCI.State.1 |  |
| frequencyDomainAllocation | 000001 | 000001 | 000001 | 000001 | 000001 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |  |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | n.a. |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | |

### A.3.14.2 TDD

**Table A.3.14.2-1: CSI-RS Reference Measurement Channels for SCS=15kHz**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CSI-RS.1.1 TDD | CSI-RS.1.2 TDD | CSI-RS.1.3 TDD | CSI-RS.1.4 TDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic |
| Resource Set Config |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on |
| aperiodicTriggeringOffset | n.a. | n.a. | 6 | 6 |
| trs-Info | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. |
| Offset | 1 | 1 | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. |
| TCI.State.1 |
| frequencyDomainAllocation | 000001 | 000001 | 000001 | 000001 |
| nrofPorts | 2 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | |

**Table A.3.14.2-2: CSI-RS Reference Measurement Channels for SCS=30kHz**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | CSI-RS.2.1 TDD | CSI-RS.2.2 TDD | CSI-RS.2.3 TDD | CSI-RS.2.4 TDD | CSI-RS.2.5 TDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic | **aperiodic** |
| Resource Set Config |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 6 | 6 | 6 |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 1 for resource #1 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot10 | slot20 | n.a. | n.a. | n.a. |
| Offset | 2 | 2 | n.a. | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | n.a. |
| TCI.State.1 |  |
| frequencyDomainAllocation | 000001 | 000001 | 000001 | 000001 | 000001 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | n.a. |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | |

----------------------------------------------------- End of Change 2 -------------------------------------------------------------------

----------------------------------------------------- Beginning of Change 3 ------------------------------------------------------------

### A.4.5.8 DL Interruptions at switching between two uplink carriers

#### A.4.5.8.1 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 8.2.1.2.14. The test case is applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present.

There are two cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters for PSCell are given in Table A. 4.5.8.1-1, Table A. 4.5.8.1-2 and Table A. 4.5.8.1-3 below.

Aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting [6dB] on the symbol#5 if UE capability *uplinkTxSwitchingPeriod* is 140us or symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us on the special slot on NR TDD carrier (Cell 2). The test parameters and applicability for E-UTRAN PCell are defined in A.3.7.2. 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. This test verifies that the UE correctly report the L1-RSRP reporting.

Table A. 4.5.8.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | PSCell (Cell2) |
| 1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A. 4.5.8.1-2: General test parameters for DL Interruptions at switching between two uplink carriers in EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2 | Two radio channels are used for the test. |
| Active cell |  | Config 1 | Cell 1: E-UTRAN PCell  Cell 2: FR1 PSCell | E-UTRAN PCell on RF channel number 1  FR1 PSCell on RF channel number 2 |
| 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 | CSI-RS.2.5 TDD |  |
| T1 | s | Config 1 | 5 |  |

Table A. 4.5.8.1-3: NR Cell specific test parameters for DL Interruptions at switching between two uplink carriers in EN-DC (Cell 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1 |  | TDD |
| TDD configuration | Config 1 |  | TDDConf.2.1 except that:  S=’10DL:2GP:2UL’;  *nrofDownlinkSymbols:10*  *nrofUplinkSymbols: 2* |
| BWchannel | Config 1 |  | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 |
| UL dedicated BWP configuration |  |  | ULBWP.1.1 |
| SRS configuration |  |  | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:   * resourceMappingstartPosition: 0 * resourceMappingnrofSymbols: n2 |
| PDSCH Reference measurement channel | Config 1 |  | SR.2.1 TDD |
| RMSI CORESET parameters | Confiq 1 |  | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 2x2 low |
| EPRE ratio of PSS to SSS | | dB | 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 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| NocNote 2 | Config 1 | dBm/SCS | -101 |
| IoNote3 | Config 1 | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1 Note 5 | | μs | 0 |
| Propagation Condition | |  | 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.4.5.8.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.1.2.14.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.1.

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

------------------------------------------------------------- End of change 3 ------------------------------------------------------------

----------------------------------------------------- Beginning of Change 4 ------------------------------------------------------------

### A.6.5.X DL interruptions at switching between two uplink carriers

#### A.6.5.X.1 DL interruptions at switching between two uplink carriers in FDD-TDD CA

##### A.6.5.X.1.1 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 8.2.2.2.10. The test case is applicable for an uplink band pair of an inter-band FDD-TDD CA configuration when the capability *uplinkTxSwitchingPeriod* is present.

There are two cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2). The test parameters for the two cells are given in Table A.6.5.X.1.1-1, Table A.6.5.X.1.1-2 and Table A.6.5.X.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 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 in the slot overlapping with the special slot of the NR TDD carrier. For NR TDD carrier (Cell 2), aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting [6dB] on the 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 in the special slot. 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.X.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 |

Table A.6.5.X.1.1-2: General test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1 | 1, 2 | Two radio channels are used for this test. |
| Active cell |  | Config 1 | Cell 1: FR1 PCell  Cell 2: FR1 SCell | FR1 PCell on RF channel number 1  FR1 SCell on RF channel number 2 |
| 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 |  |
| T1 | s | Config 1 | 5 |  |

Table A.6.5.X.1.1-3: Cell specific test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell1 | Cell2 |
| Frequency Range | |  | FR1 | FR1 |
| Duplex mode | Config 1 |  | FDD | TDD |
| TDD configuration | Config 1 |  | N/A | TDDConf.2.1 except that:  S=’10DL:2GP:2UL’;  *nrofDownlinkSymbols:10*  *nrofUplinkSymbols: 2* |
| BWchannel | Config 1 |  | 10 MHz: NRB,c = 52 | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 |  | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:   * resourceMappingstartPosition: 0 * resourceMappingnrofSymbols: n2 | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:   * resourceMappingstartPosition: 0 * resourceMappingnrofSymbols: n2 |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 |  | CR.1.1 FDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.1.1 FDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 |
| SMTC Configuration | |  | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.1 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 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 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 | -87 |
| Ês/Iot | | dB | 17 | 17 |
| Ês/Noc | | dB | 17 | 17 |
| NocNote 2 | Config 1 | dBm/SCS | -104 | -101 |
| IoNote3 | Config 1 | dBm/9.36 MHz | -58.96 | - |
| dBm/  38.16MHz | - | -52.86 |
| Time offset to Cell1 Note 5 | | μs | - | 0 |
| Propagation Condition | |  | 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.X.1.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.1.

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

------------------------------------------------------------- End of change 4 ------------------------------------------------------------

----------------------------------------------------- Beginning of Change 5 ------------------------------------------------------------

A.6.5.X.2 DL interruptions at switching between two uplink carriers in TDD-TDD CA

A.6.5.X.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 8.2.2.2.10. The test case is applicable for an uplink band pair of an inter-band TDD-TDD CA configuration when the capability *uplinkTxSwitchingPeriod* is present.

There are two cells: FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2). The test parameters for the two cells are given in Table A.6.5.X.2.1-1, Table A.6.5.X.2.1-2 and Table A.6.5.X.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 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 on the special slot. For NR TDD SCell (Cell 2), aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting [6dB] on the 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 on the 2nd special slot of every 8 slots. 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.X.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 |

**Table A.6.5.X.2.1-2: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| RF Channel Number |  | Config 1 | 1, 2 | Two radio channels are used for this test. |
| Active cell |  | Config 1 | Cell 1: FR1 PCell  Cell 2: FR1 SCell | FR1 PCell on RF channel number 1  FR1 SCell on RF channel number 2 |
| 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 |  |
| T1 | s | Config 1 | 5 |  |

**Table A.6.5.X.2.1-3: Cell specific test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell1** | **Cell2** |
| Frequency Range | |  | FR1 | FR1 |
| Duplex mode | Config 1 |  | TDD | TDD |
| TDD configuration | Config 1 |  | TDDConf.2.1 except that  S=’10DL:2GP:2UL’;  *nrofDownlinkSymbols:10*  *nrofUplinkSymbols: 2* | TDDConf.2.2 |
| BWchannel | Config 1 |  | 40 MHz: NRB,c = 106 | 40 MHz: NRB,c = 106 |
| Initial BWP Configuration | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 |  | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 |  | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:   * resourceMappingstartPosition: 0 * resourceMappingnrofSymbols: n2 | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:   * resourceMappingstartPosition: 0 * resourceMappingnrofSymbols: n2 |
| PDSCH Reference measurement channel | Config 1 |  | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 |  | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 |  | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 |
| SMTC Configuration | |  | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 |  | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 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 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 | -87 |
| Ês/Iot | | dB | 17 | 17 |
| Ês/Noc | | dB | 17 | 17 |
| NocNote 2 | Config 1 | dBm/SCS | -104 | -101 |
| IoNote3 | Config 1 | dBm/9.36 MHz | -58.96 | - |
| dBm/  38.16MHz | - | -52.86 |
| Time offset to Cell1 Note 5 | | μs | - | 0 |
| Propagation Condition | |  | 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.X.2.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.1.

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

------------------------------------------------------------- End of change 5 ------------------------------------------------------------