**3GPP TSG-RAN4 Meeting #104e *R4-2214364***

**Electronic Meeting, 15 Aug - 26 Aug, 2022**

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| --- |
| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-4** | **CR** | **0300** | **rev** | **-** | **Current version:** | **17.5.0** |  |
|  |
| *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:***  |  |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_demod\_enh2-Perf |  | ***Date:*** | 2022-09-01 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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 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:*** | Introduction of PDSCH requirement for CRS-IM |
|  |  |
| ***Summary of change:*** | Big CR for 38.101-4: merger all endorsed draft CRs in RAN4#104-e AI 9.11.2.3 for CRS-IM requirement introdcution to 38.101-4.This big CR also contains changes from Big CR R4-2210660 in RAN4 #103-e.**Changes from Big CR R4-2214364:****R4-2214743:**Update Note 2 in table 5.2.2.1.x-3 and 5.2.3.1.x-3. Update requirements with bracket in table 5.2.2.1.x-4 and 5.2.3.1.x-4.**R4-2214755:**Update general and applicability information**R4-2214764:**Update requirements with bracket in table 5.2.2.2.x-5 and 5.2.3.2.x-5. Update the description of measurement gap.**R4-2214765:**Update general and applicability information for 30kHz SCS**R4-2214782:**Update Notes in table 5.2.2.2.x-3 and 5.2.3.2.x-3. Update requirements with bracket in table 5.2.2.2.x-4 and 5.2.3.2.x-4**R4-2214870:**Add the corresponding tset setup and FRC**Changes from Big CR R4-2210660:****R4-2209738:**Added CRS and CRS-IM to the Abbreviation section.**R4-2210919:**Added general and applicability information for CRS-IM 15kHz SCS feature**R4-2210920:**Added the applicability section of CRS-IM with serving cell 30kHz receiver in TS 38.101-4.**R4-2210921:**Introduced new sections for requirements for TDD CRS-IM demod requirements for Scenario 2 with overlapping spectrum for LTE and NR 15k SCS**R4-2210922:**To add the FRC for CRS-IM 30kHz SCS test requirements for TDD.**R4-2210924:**Adding FRC for CRS-IM 15kHz SCS test requirements for FDD and TDD.**R4-2210925:**Introduced new sections for requirements for FDD CRS-IM demod requirements for DSS Scenario**R4-2210927:**Introduced new sections for requirements for TDD CRS-IM demod requirements for DSS Scenario**R4-2210928:**Add an new interfence model appendix for CRS-IM feature**R4-2210929:**Added the requirements for CRS-IM receiver for 15kHz SCS FDD scenario 2**R4-2210930:**Added the requirements for CRS-IM receiver for 30kHz SCS TDD scenario  |
|  |  |
| ***Consequences if not approved:*** | Requirements will not be defined for CRS-IM  |
|  |  |
| ***Clauses affected:*** | 3.3, 5.1.1.3, 5.2.2.1.x (New), 5.2.3.1.x (New), 5.2.3.2.x (New), 5.2.2.2.x (New), A.3.2.1.1, A.3.2.2.1, A.3.2.2.2 (New), B.x (New) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.521-4  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This Big CR also contains endorsed changes from Big CR R4-2210660. |
|  |  |
| ***This CR's revision history:*** |  |

**<Start of change 1>**

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AGC Automatic Gain Control

CA Carrier Aggregation

CC Component Carrier

CCE Control Channel Element

CORESET Control Resource Set

CP Cyclic Prefix

CSI Channel-State Information

CSI-IM CSI Interference Measurement

CSI-RS CSI Reference Signal

CW Codeword

CQI Channel Quality Indicator

CRC Cyclic Redundancy Check

CRI CSI-RS Resource Indicator

CRS Cell-specific Reference Signal

CRS-IM CRS-Interference Mitigation

DC Dual Connectivity

DCI Downlink Control Information

DL Downlink

DMRS Demodulation Reference Signal

DPS Dynamic Point Selection

EPRE Energy Per Resource Element

EN-DC E-UTRA-NR Dual Connectivity

FR Frequency Range

FRC Fixed Reference Channel

GNSS Global Navigation Satellite System

HARQ Hybrid Automatic Repeat Request

HST High Speed Train

HST-SFN High Speed Train Single Frequency Network

LI Layer Indicator

MAC Medium Access Control

MCS Modulation and Coding Scheme

MIB Master Information Block

NR New Radio

NSA Non-Standalone Operation Mode

OCC Orthogonal Cover Code

OCNG OFDMA Channel Noise Generator

OFDM Orthogonal Frequency Division Multiplexing

OFDMA Orthogonal Frequency Division Multiple Access

PBCH Physical Broadcast Channel

Pcell Primary Cell

PDCCH Physical Downlink Control Channel

PDSCH Physical Downlink Shared Channel

PMI Precoding Matrix Indicator

PRB Physical Resource Block

PRG Physical resource block group

PSBCH Physical Sidelink Broadcast Channel

PSCCH Physical Sidelink Control Channel

PSFCH Physical Sidelink Feedback Channel

PSS Primary Synchronization Signal

PSSCH Physical Sidelink Shared Channel

PTRS Phase Tracking Reference Signal

PUCCH Physical Uplink Control Channel

PUSCH Physical Uplink Shared Channel

QCL Quasi Co-location

RB Resource Block

RBG Resource Block Group

RE Resource Element

REG Resource Element Group

RI Rank Indicator

RRC Radio Resource Control

SA Standalone operation mode

SCI Sidelink Control Information

SCS Subcarrier Spacing

SINR Signal-to-Interference-and-Noise Ratio

SL Sidelink

SLSS Sidelink Synchronization Signal

SNR Signal-to-Noise Ratio

SS Synchronization Signal

SSB Synchronization Signal Block

SSS Secondary Synchronization Signal

TCI Transmission Configuration Indicator

TDM Time division multiplexing

TRxP Transmission and Reception Point

TTI Transmission Time Interval

UL Uplink

V2X Vehicle to Everything

VRB Virtual Resource Block

**<End of change 1>**

**<Start of change 2>**

#### 5.1.1.3 Applicability of requirements for optional UE features

The performance requirements in Table 5.1.1.3-1 shall apply for UEs which support optional UE features only.

Table 5.1.1.3-1: Requirements applicability for optional UE features

|  |  |  |  |
| --- | --- | --- | --- |
| UE feature/capability [14] | Test type | Test list | Applicability notes |
| SU-MIMO Interference Mitigation advanced receiver | FR1 FDD | PDSCH | Clause 5.2.2.1.1 (Test 3-1)Clause 5.2.3.1.1 (Test 5-1) |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.1 (Test 3-1)Clause 5.2.3.2.1 (Test 5-1) |  |
| Alternative additional DMRS position for co-existence with LTE CRS *(additionalDMRS-DL-Alt)* | FR1 FDD | PDSCH | Clause 5.2.2.1.4 (Test 1-2)Clause 5.2.3.1.4 (Test 1-2) |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.4 (Test 1-2)Clause 5.2.3.2.4 (Test 1-2) |  |
| Basic DL NR-NR CA operation (*supportedBandCombinationList*) | NR CA | SDR | Clause 5.5A.1 | 1)Up to 16 DL carriers2)Same numerology across carrier for data/control channel at a given time |
| Enhanced demodulation processing for HST-SFN joint transmission scheme with velocity up to 500km/h | FR1 FDD | PDSCH | Clause 5.2.2.1.9 (Test 1-1)Clause 5.2.3.1.9 (Test 1-1) |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.9 (Test 1-1)Clause 5.2.3.2.9 (Test 1-1) |  |
| Alternative 64QAM MCS table for PDSCHNew 64QAM MCS table for PDSCH (*dl-64QAM-MCS-TableAlt*) | FR1 FDD | PDSCH | Clause 5.2.2.1.5Clause 5.2.3.1.5Clause 5.2.2.1.6Clause 5.2.3.1.6 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.5Clause 5.2.3.2.5Clause 5.2.2.2.6Clause 5.2.3.2.6 |  |
| CQI table with target BLER of 10^-5New CQI table (cqi-TableAlt) | FR1 FDD | PDSCH | Clause 5.2.2.1.5Clause 5.2.3.1.5 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.5Clause 5.2.3.2.5 |  |
| PDSCH repetitions over multiple slots *(pdsch-RepetitionMultiSlots)*  | FR1 FDD | PDSCH | Clause 5.2.2.1.6Clause 5.2.3.1.6 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.6Clause 5.2.3.2.6 |  |
| UE PDSCH processing capability #2 *(pdsch-ProcessingType2)* | FR1 FDD | PDSCH | Clause 5.2.2.1.7Clause 5.2.3.1.7 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.7Clause 5.2.3.2.7 |  |
| Pre-emption indication for DL *(pre-EmptIndication-DL)* | FR1 FDD | PDSCH | Clause 5.2.2.1.8Clause 5.2.3.1.8 |  |
|  | FR1 TDD | PDSCH | Clause 5.2.2.2.8Clause 5.2.3.2.8 |  |
| Single DCI based SDM transmission for multi-TRxP (singleDCI-SDM-scheme-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.11Clause 5.2.3.1.11 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.11Clause 5.2.3.2.11 |  |
| Multi DCI based multi-TRxP support (multiDCI-MultiTRP-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.12Clause 5.2.3.1.12 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.12Clause 5.2.3.2.12 |  |
| Single DCI based FDM Scheme-A for multi-TRxP(supportFDM-SchemeA-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.13Clause 5.2.3.1.13 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.13Clause 5.2.3.2.13 |  |
| Single DCI based inter-slot TDM for multi-TRxP (supportInter-slotTDM-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.14Clause 5.2.3.1.14 |  |
| FR1 TDD | PDSCH | Clause 5.2.2.2.14Clause 5.2.3.2.14 |  |
| Maximum number of TCI states in Single-DCI based inter-slot TDM (maxNumberTCI-states-r16) | FR1 FDD | PDSCH | Clause 5.2.2.1.14Clause 5.2.3.1.14 | The requirements apply only when maxNumberTCI-states-r16 = 2. |
| FR1 TDD | PDSCH | Clause 5.2.2.2.14Clause 5.2.3.2.14 |
| DRX Adaptation (*drx-Adaptation-r16*) | FR1 FDD | PDCCH | Clause 5.3.2.1.3 | If the Test 1 in Clause 5.3.2.1.3 is passed, the test coverage can be considered fulfilled without executing Test 3 in clause 5.3.2.1.1. |
| FR1 TDD | PDCCH | Clause 5.3.2.2.3 | If the Test 1 in Clause 5.3.2.2.3 is passed, the test coverage can be considered fulfilled without executing Test 2 in clause 5.3.2.2.1. |
| FR1 FDD | PDCCH | Clause 5.3.3.1.3 | If the Test 1 in Clause 5.3.3.1.3 is passed, the test coverage can be considered fulfilled without executing Test 3 in clause 5.3.3.1.1. |
| FR1 TDD | PDCCH | Clause 5.3.3.2.3 | If the Test 1 in Clause 5.3.3.2.3 is passed, the test coverage can be considered fulfilled without executing Test 2 in clause 5.3.3.2.1. |
| Validating P/SP-CSI-RS reception (*periodicAndSemi-PersistentCSI-RS-r16*) | FR1 TDD | PDSCH | Clause 5.2.2.2.15Clause 5.2.3.2.15Clause 5.2A.2.3Clause 5.2A.3.3 | The requirements apply only in case tested UE supporting operations in shared spectrum access and validation of P/SP-CSI-RS reception based on DCI |
| Supported UL channels for dynamic channel access mode (*ul-DynamicChAccess-r16*) or UL channel access for semi-static channel access mode (ul-Semi-StaticChAccess-r16) or both | FR1 TDD | PDSCH | Clause 5.2.2.2.15Clause 5.2.3.2.15 | The requirements apply only in case tested UE supports one of UL channels for dynamic channel access mode and UL channel access for semi-static channel access mode |
| Support of neighboring LTE cell CRS-IM in DSS scenario with NR 15 kHz SCS ( *CRS-IM-DSS-15kHzSCS-r17*)  | FR1 FDD | PDSCH | Clause 5.2.2.1.X1Clause 5.2.3.1.X1 | UE can support the feature on the CC(s) in a band only if the UE indicates support of rateMatchingLTE-CRS on that band. |
| FR1 TDD | PDSCH | Clause 5.2.2.2.X1Clause 5.2.3.2.X1 |
| Support of neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth (*CRS-IM-nonDSS-15kHzSCS-r17* ) | FR1 FDD | PDSCH | Clause 5.2.2.1.X2 (Test 1-1)Clause 5.2.3.1.X2 (Test 1-1) | The UE can perform CRS-IM when MeasObjectEUTRA IE is configured, and the configured measurement gaps overlap with neighbour LTE cell PBCH position. |
| FR1 TDD | PDSCH | Clause 5.2.2.2.X2 (Test 1-1)Clause 5.2.3.2.X2 (Test 1-1) |
| Support of neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth (*CRS-IM-nonDSS-NWA-15kHzSCS-r17* ) | FR1 FDD | PDSCH | Clause 5.2.2.1.X2 (Test 2-1)Clause 5.2.3.1.X2 (Test 2-1) | If the Test 1-1 in Clause 5.2.2.2.X2 is passed, the test coverage can be considered fulfilled without executing Test 2-1 in clause 5.2.2.2.X2.If the Test 1-1 in Clause 5.2.3.2.X2 is passed, the test coverage can be considered fulfilled without executing Test 2-1 in clause 5.2.3.2.X2. |
| FR1 TDD | PDSCH | Clause 5.2.2.2.X2 (Test 2-1)Clause 5.2.3.2.X2 (Test 2-1) |
| CRS-IM in non-DSS and 30 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth (*crs-IM-nonDSS-30kHzSCS-r17* ) | FR1 TDD | PDSCH | Clause 5.2.2.2.X2 (Test 1-2)Clause 5.2.3.2.X2 (Test 1-2) | The UE can perform CRS-IM when MeasObjectEUTRA IE is configured, and the configured measurement gaps overlap with neighbour LTE cell PBCH position. |
| CRS-IM in non-DSS and 30 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth (crs*-IM-nonDSS-NWA-30kHzSCS-r17* ) | FR1 TDD | PDSCH | Clause 5.2.2.2.X2 (Test 2-2)Clause 5.2.3.2.X2 (Test 2-2) | If the Test 1-2 in Clause 5.2.2.2.X2 is passed, the test coverage can be considered fulfilled without executing Test 2-2 in clause 5.2.2.2.X2.If the Test 1-2 in Clause 5.2.3.2.X2 is passed, the test coverage can be considered fulfilled without executing Test 2-2 in clause 5.2.3.2.X2. |

#### 5.1.1.4 Applicability of requirements for mandatory UE features with capability signalling

**<End of change 2>**

**<Start of change 3>**

5.2.2.1.x1 Minimum requirements for PDSCH CRS interference mitigation under NR-LTE coexistence scenario

The performance requirements are specified in Table 5.2.2.1.x1-4, with the addition of test parameters in Table 5.2.2.1.x1-2 for the serving cell and Table 5.2.2.1.x1-3 for the LTE interference cells and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.1.x1-1.

**Table 5.2.2.1.x1-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH CRS interference mitigation performance under 2 receive antenna conditions with CRS rate matching configured for the serving cell.  | 1-1 |

Table 5.2.2.1.x1-2: Test parameters for the serving cell

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | FDD |
| Active DL BWP index |  | 1 |
| NR UL transmission with a 7.5 kHz shift to the LTE raster  |  | true |
| PDCCH configuration | Symbols with PDCCH |  | Symbol# 2 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 3 |
|  | Length (L) |  | 9 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2  |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Position of the first DM-RS for downlink |  | 3 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| CRS for rate matching (Note 1) | LTE carrier centre subcarrier location |  | Same as NR carrier centre subcarrier location |
|  | LTE carrier BW | MHz | 10 |
|  | Number of antenna ports |  | 2 |
|  | v-shift |  | 0 |
| Number of HARQ Processes |  | 4 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | 2 |
| Note 1: No MBSFN is configured on LTE carrier.Note 2: Network-based CRS interference mitigation is disabled on LTE carrier. |

Table 5.2.2.1.x1-3: Test parameters for the LTE interference cells

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Propagation conditions and MIMO configuration (Note 1) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| INR (Note 2) | dB | 10.45 | 4.6 |
| Cell-specific reference signals |  | Antenna ports 0,1 | Antenna ports 0,1 |
| Carrier centre subcarrier location |  | Same as the serving carrier centre subcarrier location | Same as the serving carrier centre subcarrier location |
| BWChannel | MHz | 10 | 10 |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| Number of control OFDM symbols |  | 2 | 2 |
| PDSCH transmission mode |  | 4 | 4 |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Probability of occurrence of PDSCH data | % | 20 | 20 |
| Probability of occurrence of transmission rank | Rank 1 | % | 80 | 80 |
| Rank 2 | % | 20 | 20 |
| Downlink power allocation |  | dB | -3 | -3 |
|  | dB | -3 | -3 |
| σ | dB | 0 | 0 |
| Precoding granularity | PRB | 6 | 6 |
| Time offset to the serving cell | us | 3 | -1 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| MBSFN |  | Not configured | Not configured |
| Network-based CRS interference mitigation |  | Disabled | Disabled |
| Note 1: The channel for the LTE interference cells and the serving cell are independent.Note 2: Defined in B.6.1. |

Table 5.2.2.1.x1-4: Minimum performance for Rank 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.1-7.3 FDD | 10 / 15 | 16QAM, 0.48 | TDLA30-10  | 2x2, ULA Low  | 70 | [11.9] |

**<End of change 3>**

**<Start of change 4>**

5.2.3.1.x1 Minimum requirements for PDSCH CRS interference mitigation under NR-LTE coexistence scenario

The performance requirements are specified in Table 5.2.3.1.x1-4, with the addition of test parameters in Table 5.2.3.1.x1-2 for the serving cell and Table 5.2.3.1.x1-3 for the LTE interference cells and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.1.x1-1.

**Table 5.2.3.1.x1-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH CRS interference mitigation performance under 4 receive antenna conditions with CRS rate matching configured for the serving cell.  | 1-1 |

Table 5.2.3.1.x1-2: Test parameters for the serving cell

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | FDD |
| Active DL BWP index |  | 1 |
| NR UL transmission with a 7.5 kHz shift to the LTE raster  |  | true |
| PDCCH configuration | Symbols with PDCCH |  | Symbol# 2 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 3 |
|  | Length (L) |  | 9 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2  |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Position of the first DM-RS for downlink |  | 3 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| CRS for rate matching (Note 1) | LTE carrier centre subcarrier location |  | Same as NR carrier centre subcarrier location |
|  | LTE carrier BW | MHz | 10 |
|  | Number of antenna ports |  | 2 |
|  | v-shift |  | 0 |
| Number of HARQ Processes |  | 4 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | 2 |
| Note 1: No MBSFN is configured on LTE carrier.Note 2: Network-based CRS interference mitigation is disabled on LTE carrier. |

Table 5.2.3.1.x1-3: Test parameters for the LTE interference cells

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Propagation conditions and MIMO configuration (Note 1) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| INR (Note 2) | dB | 10.45 | 4.6 |
| Cell-specific reference signals |  | Antenna ports 0,1 | Antenna ports 0,1 |
| Carrier centre subcarrier location |  | Same as the serving carrier centre subcarrier location | Same as the serving carrier centre subcarrier location |
| BWChannel | MHz | 10 | 10 |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| Number of control OFDM symbols |  | 2 | 2 |
| PDSCH transmission mode |  | 4 | 4 |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Probability of occurrence of PDSCH data | % | 20 | 20 |
| Probability of occurrence of transmission rank | Rank 1 | % | 80 | 80 |
| Rank 2 | % | 20 | 20 |
| Downlink power allocation |  | dB | -3 | -3 |
|  | dB | -3 | -3 |
| σ | dB | 0 | 0 |
| Precoding granularity | PRB | 6 | 6 |
| Time offset to the serving cell | us | 3 | -1 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| MBSFN |  | Not configured | Not configured |
| Network-based CRS interference mitigation |  | Disabled | Disabled |
| Note 1: The channel for the LTE interference cells and the serving cell are independent.Note 2: Defined in B.6.1. |

Table 5.2.3.1.x1-4: Minimum performance for Rank 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.1-7.3 FDD | 10 / 15 | 16QAM, 0.48 | TDLA30-10  | 2x4, ULA Low  | 70 | [8.0] |

**<End of change 4>**

**<Start of change 5>**

5.2.2.2.x1 Minimum requirements for PDSCH CRS interference mitigation under NR-LTE coexistence scenario

The performance requirements are specified in Table 5.2.2.2.x1-4, with the addition of test parameters in Table 5.2.2.2.x1-2 for the serving cell and Table 5.2.2.2.x1-3 for the LTE interference cells and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.2.x1-1.

**Table 5.2.2.2.x1-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH CRS interference mitigation performance under 2 receive antenna conditions with CRS rate matching configured for the serving cell.  | 1-1 |

Table 5.2.2.2.x1-2: Tests parameters for serving cell PDSCH

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | TDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 3 |
|  | Length (L) |  | 9 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2  |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| CRS for rateMatchin (Note 1) | LTE carrier centre subcarrier location |  | Same as NR carrier centre subcarrier location |
| LTE carrier BW | Hz | 20 |
| Number of antenna ports |  | 4 |
| v-shift |  | 0 |
| Number of HARQ Processes |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | Specific to each TDD UL-DL pattern and as defined in Annex A.1.2 |
| Note 1: No MBSFN is configured on LTE carrier.Note 2: Network-based CRS interference mitigation is disabled on LTE carrier |

Table 5.2.2.2.x1-3: Tests parameter for interference cells

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Duplex mode |  | TDD | TDD |
| TDD UL-DL pattern |  | DSUDDDSUDDS = 10D + 2G + 2U | DSUDDDSUDDS = 10D + 2G + 2U |
| INR (Note 1) | dB | 10.45 | 4.6 |
| LTE Bandwidth | MHz | 20 | 20 |
| Carrier centre subcarrier location |  | Same as the NR serving carrier centre subcarrier location | Same as the NR serving carrier centre subcarrier location |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| CRS pattern | Number of antenna ports |  | 4 | 4 |
| v-shift |  | 1 | 2 |
| Downlink power allocation |  | dB | -6 | -6 |
|  | dB | -6 | -6 |
| σ | dB | 0 | 0 |
| PDSCH transmission mode |  | TM4 | TM4 |
| PDSCH loading level | % | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain. | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain. |
| Transmission rank | % | 80% and 20% probability for rank 1 and rank 2 respectively | 80% and 20% probability for rank 1 and rank 2 respectively |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Time offset to the serving cell | us | 3 | -1 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| Propagation conditions and MIMO configuration (Note 2) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| Precoding granularity | PRB | 8 | 8 |
| Note 1: Defined in B.6.1Note 2: The channel for the LTE interference cells and the serving cell are independent. |

Table 5.2.2.2.x1-4: Minimum performance for Rank 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.1-1.3 TDD | 20 / 15 | 16QAM, 0.48 | FR1.15-1 | TDLA30-10  | 4x2, ULA Low  | 70 | [12.5] |

**<End of change 5>**

**<Start of change 6>**

5.2.3.2.x1 Minimum requirements for PDSCH CRS interference mitigation under NR-LTE coexistence scenario

The performance requirements are specified in Table 5.2.3.2.x1-4, with the addition of test parameters in Table 5.2.3.2.x1-2 for the serving cell and Table 5.2.3.2.x1-3 for the LTE interference cells and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.2.x1-1.

**Table 5.2.3.2.x1-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH CRS interference mitigation performance under 4 receive antenna conditions with CRS rate matching configured for the serving cell.  | 1-1 |

Table 5.2.3.2.x1-2: Test parameters for the serving cell

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | TDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 3 |
|  | Length (L) |  | 9 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2  |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| CRS for rateMatchin (Note 1) | LTE carrier centre subcarrier location |  | Same as NR carrier centre subcarrier location |
| LTE carrier BW | Hz | 20 |
| Number of antenna ports |  | 4 |
| v-shift |  | 0 |
| Number of HARQ Processes |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | Specific to each TDD UL-DL pattern and as defined in Annex A.1.2 |
| Note 1: No MBSFN is configured on LTE carrier.Note 2: Network-based CRS interference mitigation is disabled on LTE carrier |

Table 5.2.3.2.x1-3: Test parameters for the LTE interference cells

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Duplex mode |  | TDD | TDD |
| TDD UL-DL pattern |  | DSUDDDSUDDS = 10D + 2G + 2U | DSUDDDSUDDS = 10D + 2G + 2U |
| INR (Note 1) | dB | 10.45 | 4.6 |
| LTE Bandwidth | MHz | 20 | 20 |
| Carrier centre subcarrier location |  | Same as the NR serving carrier centre subcarrier location | Same as the NR serving carrier centre subcarrier location |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| CRS pattern | Number of antenna ports |  | 4 | 4 |
| v-shift |  | 1 | 2 |
| Downlink power allocation |  | dB | -6 | -6 |
|  | dB | -6 | -6 |
| σ | dB | 0 | 0 |
| PDSCH transmission mode |  | TM4 | TM4 |
| PDSCH loading level | % | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain. | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain. |
| Transmission rank | % | 80% and 20% probability for rank 1 and rank 2 respectively | 80% and 20% probability for rank 1 and rank 2 respectively |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Time offset to the serving cell | us | 3 | -1 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| Propagation conditions and MIMO configuration (Note 2) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| Precoding granularity | PRB | 8 | 8 |
| Note 1: Defined in B.6.1Note 2: The channel for the LTE interference cells and the serving cell are independent. |

Table 5.2.3.2.x1-4: Minimum performance for Rank 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.1-1.3 TDD | 20 / 15 | 16QAM, 0.48 | FR1.15-1 | TDLA30-10  | 4x4, ULA Low  | 70 | [8.8] |

**<End of change 6>**

**<Start of change 7>**

##### 5.2.2.1.x2 Minimum requirements for PDSCH with inter cell CRS interference

The performance requirements are specified in Table 5.2.2.1.x2-4 and Table 5.2.2.1.x2-5, with the addition of test parameters in Table 5.2.2.1.x2-2 and 5.2.2.1.x2-3 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.1.x2-1.

Table 5.2.2.1.x2-1: Tests purpose

|  |  |
| --- | --- |
| Purpose | Test index |
| Verify PDSCH performance under 2 receive antenna conditions when PDSCH is interfered by inter cell CRS signal | 1-1 and 2-1 |

Table 5.2.2.1.x2-2: Tests parameter for serving cell PDSCH

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | FDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 2 |
|  | Length (L) |  | 12 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2 |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Number of HARQ Processes |  | 4 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | 2 |

Table 5.2.2.1.x2-3: Tests parameter for interference cells

|  |  |  |  |
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| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Duplex mode |  | FDD | FDD |
| INR | dB | 10.45 | 4.6 |
| LTE Bandwidth | MHz | 20 | 20 |
| Carrier centre subcarrier location |  | Same as the NR serving carrier centre subcarrier location | Same as the NR serving carrier centre subcarrier location |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| CRS pattern | Number of antenna ports |  | 4 | 4 |
| v-shift |  | 1 | 2 |
| Downlink power allocation |  | dB | -6 | -6 |
|  | dB | -6 | -6 |
| σ | dB | 0 | 0 |
| PDSCH transmission mode |  | TM4 | TM4 |
| PDSCH loading level | % | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1. | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1. |
| Transmission rank | % | 80% and 20% probability for rank 1 and rank 2 respectively | 80% and 20% probability for rank 1 and rank 2 respectively |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Time offset to the serving cell | us | 3 | -1 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| Propagation conditions and MIMO configuration (Note 1) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| Precoding granularity | PRB | 8 | 8 |
| Note 1: The channel for the LTE interference cells and the serving cell are independent.Note 2: No MBSFN is configured on LTE carrier.Note 3: Network-based CRS interference mitigation is disabled on LTE carrier.Note 4: The start of transmission of LTE frame is delayed by 2 LTE subframes with respect to the start of transmission of NR frame |

The requirements for UE capable of performing CRS-IM with the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.2.1.x2-4.

Table 5.2.2.1.x2-4: Minimum performance for Rank 1 with the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation****condition** | **Correlation matrix and antenna configuration** | **Reference value** |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH.1-17.1 FDD  | 10 / 15 | 16QAM, 0.48 | TDLA30-10  | 4x2, ULA Low | 70 | [11.9] |

The requirements for UE capable of performing CRS-IM without the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.2.1.x2-6 with following test procedure:

The network configures an inter-RAT LTE measurement object of the interfering cells to the tested UE. Inter-RAT measurement is configured at the beginning of the test and applied throughout the test with gap pattern configurations in Table 5.2.2.1.x-5. PDSCH is not scheduled and throughput is not counted during 4.64s after the beginning of test. PDSCH is not scheduled in the measurement gaps.

Table 5.2.2.1.x2-5: Measurement Gap configurations

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Measurement Gap Length  | ms | 6 |
| Measurement Gap Repetition Period | ms | 40 |
| Gap offset | ms | [7] |
| Measurement gap timeing advance | ms | 0 |

Table 5.2.2.1.x2-6: Minimum performance for Rank 1 without the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation****condition** | **Correlation matrix and antenna configuration** | **Reference value** |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 2-1 | R.PDSCH.1-17.2 FDD  | 10 / 15 | 16QAM, 0.48 | TDLA30-10  | 4x2, ULA Low | 70 | [11.9] |

##### 5.2.3.1.x2 Minimum requirements for PDSCH with inter cell CRS interference

The performance requirements are specified in Table 5.2.3.1.x2-4 and Table 5.2.3.1.x2-5, with the addition of test parameters in Table 5.2.3.1.x2-2 and 5.2.3.1.x2-3 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.1.x2-1.

Table 5.2.3.1.x2-1: Tests purpose

|  |  |
| --- | --- |
| Purpose | Test index |
| Verify PDSCH performance under 4 receive antenna conditions when PDSCH is interfered by inter cell CRS signal | 1-1 and 2-1 |

Table 5.2.3.1.x2-2: Tests parameter for serving cell PDSCH

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | FDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 2 |
|  | Length (L) |  | 12 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2 |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Number of HARQ Processes |  | 4 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | 2 |

Table 5.2.3.1.x2-3: Tests parameter for interference cells

|  |  |  |  |
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| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Duplex mode |  | FDD | FDD |
| INR | dB | 10.45 | 4.6 |
| LTE Bandwidth | MHz | 20 | 20 |
| Carrier centre subcarrier location |  | Same as the NR serving carrier centre subcarrier location | Same as the NR serving carrier centre subcarrier location |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| CRS pattern | Number of antenna ports |  | 4 | 4 |
| v-shift |  | 1 | 2 |
| Downlink power allocation |  | dB | -6 | -6 |
|  | dB | -6 | -6 |
| σ | dB | 0 | 0 |
| PDSCH transmission mode |  | TM4 | TM4 |
| PDSCH loading level | % | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1. | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1. |
| Transmission rank | % | 80% and 20% probability for rank 1 and rank 2 respectively | 80% and 20% probability for rank 1 and rank 2 respectively |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Time offset to the serving cell | us | 3 | -1 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| Propagation conditions and MIMO configuration (Note 1) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| Precoding granularity | PRB | 8 | 8 |
| Note 1: The channel for the LTE interference cells and the serving cell are independent.Note 2: No MBSFN is configured on LTE carrier.Note 3: Network-based CRS interference mitigation is disabled on LTE carrier.Note 4: The start of transmission of LTE frame is delayed by 2 LTE subframes with respect to the start of transmission of NR frame |

The requirements for UE capable of performing CRS-IM with the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.3.1.x2-4:

Table 5.2.3.1.x2-4: Minimum performance for Rank 1 with the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation****condition** | **Correlation matrix and antenna configuration** | **Reference value** |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | R.PDSCH.1-17.1 FDD  | 10 / 15 | 16QAM, 0.48 | TDLA30-10  | 4x4, ULA Low | 70 | [8.0] |

The requirements for UE capable of performing CRS-IM without the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.3.1.x2-6 with following test procedure:

The network configures an inter-RAT LTE measurement object of the interfering cells to the tested UE. Inter-RAT measurement is configured at the beginning of the test and applied throughout the test with gap pattern configurations in Table 5.2.2.1.x-5. PDSCH is not scheduled and throughput is not counted during 4.64s after the beginning of test. PDSCH is not scheduled in the measurement gaps.

Table 5.2.3.1.x2-5: Measurement Gap configurations

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Measurement Gap Length  | ms | 6 |
| Measurement Gap Repetition Period | ms | 40 |
| Gap offset | ms | [7] |
| Measurement gap timeing advance | ms | 0 |

Table 5.2.3.1.x2-6: Minimum performance for Rank 1 without the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation****condition** | **Correlation matrix and antenna configuration** | **Reference value** |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 2-1 | R.PDSCH.1-17.2 FDD  | 10 / 15 | 16QAM, 0.48 | TDLA30-10  | 4x4, ULA Low | 70 | [8.0] |

**<End of change 7>**

**<Start of change 8>**

5.2.2.2.x2 Minimum requirements for PDSCH with inter cell CRS interference

The performance requirements are specified in Table 5.2.2.2.x2-5 and Table 5.2.2.2.x2-6, with the addition of test parameters in Table 5.2.2.2.x2-2 for the serving cell and Table 5.2.2.2.x2-3 for the LTE interference cells and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.2.x2-1.

**Table 5.2.2.2.x2-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH performance under 2 receive antenna conditions when PDSCH is interfered by inter cell CRS signal | 1-1, 1-2, 2-1 and 2-2 |

Table 5.2.2.2.x2-2: Tests parameters for serving cell PDSCH

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | TDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 2 |
|  | Length (L) |  | 12 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2  |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Number of HARQ Processes |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | Specific to each TDD UL-DL pattern and as defined in Annex A.1.2 |

Table 5.2.2.2.x2-3: Tests parameter for interference cells

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Duplex mode |  | TDD | TDD |
| TDD UL-DL pattern |  | DSUDDDSUDDS = 10D + 2G + 2U | DSUDDDSUDDS = 10D + 2G + 2U |
| INR (Note 5) | dB | 10.45 | 4.6 |
| LTE Bandwidth | MHz | 20 | 20 |
| Carrier centre subcarrier location |  | Same as the NR serving carrier centre subcarrier location | Same as the NR serving carrier centre subcarrier location |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| CRS pattern | Number of antenna ports |  | 4 | 4 |
| v-shift |  | 1 | 2 |
| Downlink power allocation |  | dB | -6 | -6 |
|  | dB | -6 | -6 |
| σ | dB | 0 | 0 |
| PDSCH transmission mode |  | TM4 | TM4 |
| PDSCH loading level | % | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1.10% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-2. | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1.10% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-2. |
| Transmission rank | % | 80% and 20% probability for rank 1 and rank 2 respectively | 80% and 20% probability for rank 1 and rank 2 respectively |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Time offset to the serving cell | us | 3 for test 1-11.5 for test 1-2 | -1 for test 1-1-0.5 for test 1-2 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| Propagation conditions and MIMO configuration (Note 1) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| Precoding granularity | PRB | 8 | 8 |
| Note 1: The channel for the LTE interference cells and the serving cell are independent.Note 2: No MBSFN is configured on LTE carrier.Note 3: Network-based CRS interference mitigation is disabled on LTE carrier.Note 4: The start of transmission of LTE frame is delayed by 2 LTE subframes with respect to the start of transmission of NR frameNote 5: Defined in B.6.1 |

The requirements for UE capable of performing CRS-IM without the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.2.2.x2-5 with following test procedure:

1. Configure the MeasObjectEUTRA IE
2. Configure the measurement gap
3. Schedule the transmission of interference cell
4. Extra time = 4640ms
5. Schedule NR PDSCH transmission after Extra time

The network configures an inter-RAT LTE measurement object of the interfering cells to the tested UE. Inter-RAT measurement is configured at the beginning of the test and applied throughout the test with gap pattern configurations according to Table 5.2.2.2.x2-4. PDSCH is not scheduled and throughput is not counted during 4.64s after the beginning of test. PDSCH is not scheduled in the measurement gaps.

Table 5.2.2.2.x2-4: Measurement Gap configurations

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Measurement Gap Length (mgl) | ms | 6 |
| Measurement Gap Repetition Period (mgrp) | ms | 40 |
| Gap offset (gapoffset) | ms | [1] |
| Measurement gap timeing advance (mgta) | ms | 0 |

Table 5.2.2.2.x2-5: Minimum performance for Rank 1 without the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.1-4.2 TDD  | 20 / 15 | 16QAM, 0.48 | FR1.15-1 | TDLA30-10  | 4x2, ULA Low  | 70 | [12.3] |
| 1-2 | R.PDSCH.2-26.1 TDD | 20 / 30 | 16QAM, 0.48 | FR1.30-1 | TDLA30-10 | 4x2, ULA Low | 70 | [11.7] |

The requirements for UE capable of performing CRS-IM with the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.2.2.x2-6:

Table 5.2.2.2.x2-6 Minimum performance for Rank 1 with the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 2-1 | R.PDSCH.1-4.1 TDD | 20 / 15 | 16QAM, 0.48 | FR1.15-1 | TDLA30-10  | 4x2, ULA Low  | 70 | [12.3] |
| 2-2 | R.PDSCH.2-25.1 TDD | 20 / 30 | 16QAM, 0.48 | FR1.30-1 | TDLA30-10 | 4x2, ULA Low | 70 | [11.7] |

**<End of change 8>**

**<Start of change 9>**

5.2.3.2.x2 Minimum requirements for PDSCH with inter cell CRS interference

The performance requirements are specified in Table 5.2.3.2.x2-5 and Table 5.2.3.2.x2-6, with the addition of test parameters in Table 5.2.3.2.x2-2 for the serving cell and Table 5.2.3.2.x2-3 for the LTE interference cells and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.2.x2-1.

**Table 5.2.3.2.x2-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify PDSCH performance under 4 receive antenna conditions when PDSCH is interfered by inter cell CRS signal | 1-1, 1-2, 2-1 and 2-2 |

Table 5.2.3.2.x2-2: Tests parameter for serving cell PDSCH

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | TDD |
| TDD UL-DL pattern |  | FR1.15-1 |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
|  | k0 |  | 0 |
|  | Starting symbol (S)  |  | 2 |
|  | Length (L) |  | 12 |
|  | PDSCH aggregation factor |  | 1 |
|  | PRB bundling type |  | Static |
|  | PRB bundling size |  | 2  |
|  | Resource allocation type |  | Type 0 |
|  | RBG size |  | Config2 |
|  | VRB-to-PRB mapping type |  | Non-interleaved |
|  | VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
|  | Number of additional DMRS |  | 1 |
|  | Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Number of HARQ Processes |  | 8 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | Specific to each TDD UL-DL pattern and as defined in Annex A.1.2 |

Table 5.2.2.2.x2-3: Tests parameter for interference cells

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
| Duplex mode |  | TDD | TDD |
| TDD UL-DL pattern |  | DSUDDDSUDDS = 10D + 2G + 2U | DSUDDDSUDDS = 10D + 2G + 2U |
| INR | dB | 10.45 | 4.6 |
| LTE Bandwidth | MHz | 20 | 20 |
| Carrier centre subcarrier location |  | Same as the NR serving carrier centre subcarrier location | Same as the NR serving carrier centre subcarrier location |
| Cyclic Prefix |  | Normal | Normal |
| Physical cell ID |  | 1 | 2 |
| CRS pattern | Number of antenna ports |  | 4 | 4 |
| v-shift |  | 1 | 2 |
| Downlink power allocation |  | dB | -6 | -6 |
|  | dB | -6 | -6 |
| σ | dB | 0 | 0 |
| PDSCH transmission mode |  | TM4 | TM4 |
| PDSCH loading level | % | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1.10% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-2. | 20% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-1.10% probability of occurrence of LTE data transmission in time domain, and full bandwidth allocation in frequency domain for test 1-2. |
| Transmission rank | % | 80% and 20% probability for rank 1 and rank 2 respectively | 80% and 20% probability for rank 1 and rank 2 respectively |
| Interference model |  | As specified in clause B.x | As specified in clause B.x |
| Time offset to the serving cell | us | 3 for test 1-11.5 for test 1-2 | -1 for test 1-1-0.5 for test 1-2 |
| Frequency offset to the serving cell | Hz | 300 | -100 |
| Propagation conditions and MIMO configuration (Note 1) |  | TDLA30-10 ULA Low | TDLA30-10 ULA Low |
| Precoding granularity | PRB | 8 | 8 |
| Note 1: The channel for the LTE interference cells and the serving cell are independent.Note 2: No MBSFN is configured on LTE carrier.Note 3: Network-based CRS interference mitigation is disabled on LTE carrier.Note 4: The start of transmission of LTE frame is delayed by 2 LTE subframes with respect to the start of transmission of NR frame |

The requirements for UE capable of performing CRS-IM without the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.3.2.x2-5 with following test procedure:

The requirements for UE capable of performing CRS-IM without the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.3.2.X2-5 with following test procedure:

1. Configure the MeasObjectEUTRA IE
2. Configure the measurement gap
3. Schedule the transmission of interference cell
4. Extra time = 4640ms
5. Schedule NR PDSCH transmission after Extra time

The network configures an inter-RAT LTE measurement object of the interfering cells to the tested UE. Inter-RAT measurement is configured at the beginning of the test and applied throughout the test with gap pattern configurations according to Table 5.2.3.2.x2-4. PDSCH is not scheduled and throughput is not counted during 4.64s after the beginning of test. PDSCH is not scheduled in the measurement gaps.

Table 5.2.3.2.x2-4: Measurement Gap configurations

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Measurement Gap Length (mgl) | ms | 6 |
| Measurement Gap Repetition Period (mgrp) | ms | 40 |
| Gap offset (gapoffset) | ms | [1] |
| Measurement gap timeing advance (mgta) | ms | 0 |

Table 5.2.3.2.x2-5: Minimum performance for Rank 1 without the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.1-4.2 TDD  | 20 / 15 | 16QAM, 0.48 | FR1.15-1 | TDLA30-10  | 4x4, ULA Low  | 70 | [8.6] |
| 1-2 | R.PDSCH.2-26.1 TDD | 20 / 30 | 16QAM, 0.48 | FR1.30-1 | TDLA30-10 | 4x4, ULA Low | 70 | [8.2] |

The requirements for UE capable of performing CRS-IM with the assistance of network signaling on LTE channel bandwidth are specified in Table 5.2.3.2.x2-6:

Table 5.2.3.2.x2-6 Minimum performance for Rank 1 with the assistance of network signaling on LTE channel bandwidth

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | TDD UL-DL pattern | Propagation condition  | Correlation matrix and antenna configuration | Reference value |
| Fraction ofmaximumthroughput(%) | SNR (dB) |
| 2-1 | R.PDSCH.1-4.1 TDD | 20 / 15 | 16QAM, 0.48 | FR1.15-1 | TDLA30-10  | 4x4, ULA Low  | 70 | [8.6] |
| 2-2 | R.PDSCH.2-25.1 TDD | 20 / 30 | 16QAM, 0.48 | FR1.30-1 | TDLA30-10 | 4x4, ULA Low | 70 | [8.2] |

**<End of change 9>**

**<Start of change 10>**

### A.3.2.1 FDD

#### A.3.2.1.1 Reference measurement channels for SCS 15 kHz FR1

**<Unchanged part skipped>**

Table A.3.2.1.1-7: PDSCH Reference Channel for FDD LTE-NR coexistence scenario

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | R.PDSCH.1-7.1 FDD | R.PDSCH.1-7.2 FDD | R.PDSCH.1-7.3 FDD |  |  |
| Channel bandwidth | MHz | 10 | 10 | 10 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |
| Number of allocated resource blocks | PRBs | 52 | 52 | 52 |  |  |
| Number of consecutive PDSCH symbols |  | 9 | 11 | 9 |  |  |
| Allocated slots per 2 frames | Slots | 16 | 16 | 16 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 4 | 4 | 13 |  |  |
| Modulation |  | QPSK | QPSK | 16QAM |  |  |
| Target Coding Rate |  | 0.30 | 0.30 | 0.48 |  |  |
| Number of MIMO layers |  | 1 | 1 | 1 |  |  |
| Number of DMRS REs |  | 12 | 12 | 12 |  |  |
| Overhead for TBS determination |  | 18 | 18 | 12 |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | Bits | N/A | N/A | N/A |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 2472 | 3240 | 8456 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | Bits | N/A | N/A | N/A |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 16 | 16 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | CBs | N/A | N/A | N/A |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | CBs | 1 | 1 | 2 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | Bits | N/A | N/A | N/A |  |  |
|  For Slots i = 11 | Bits | 7760 | 10256 | 16224 |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {1,…, 9, 12, …, 19} | Bits | 8384 | 10880 | 17472 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 1.978 | 2.592 | 6.764 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 2 framesNote 3: No user data is scheduled on slots with LTE PBCH/PSS/SSS |

**<Unchanged part skipped>**

Table A.3.2.1.1-17: PDSCH Reference Channel for FDD CRS interference mitigation for NR scenario

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | R.PDSCH.1-17.1 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 2 frames | Slots | 16 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | Bits | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 13064 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | Bits | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | CBs | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {0,…,19} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15 | Bits | N/A |  |  |  |  |
|  For Slots i = 11 | Bits | 22880 |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} for i from {1,…, 9, 12, …, 19} | Bits | 24128 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 10.4512 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 2 framesNote 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell |

Table A.3.2.1.1-x: PDSCH Reference Channel for FDD CRS interference mitigation for NR scenario for inter-RAT measurement enabled

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | R.PDSCH.1-17.2 FDD |  |  |  |  |
| Channel bandwidth | MHz | 10 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Number of allocated resource blocks | PRBs | 52 |  |  |  |  |
| Number of consecutive PDSCH symbols |  | 12 |  |  |  |  |
| Allocated slots per 4 frames | Slots | 26 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
|  For Slots i = 0,5,10,15,20,25,30,35 |  | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 |  | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15,20,25,30,35 | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 | Bits | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 | Bits | 13064 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15,20,25,30,35 | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 | Bits | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slots i = 0,5,10,15,20,25,30,35 | CBs | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 | CBs | N/A |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12 | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
| For Slots i = 0,5,10,15,20,25,30,35 | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= 7,8,9,10,11,12 |  | N/A |  |  |  |  |
| For Slots i = {11, 31} |  | 22880 |  |  |  |  |
|  For Slots i, if mod(i, 5) = {1,2,3,4} and i≠7,8,9,11,12,31 | Bits | 24128 |  |  |  |  |
| Max. Throughput averaged over 4 frames | Mbps | 8.4916 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 4 framesNote 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell Note 4: No user data is scheduled on slots used for measurement |

**<End of change 12>**

**<Start of change 13>**

### A.3.2.2 TDD

#### A.3.2.2.1 Reference measurement channels for SCS 15 kHz FR1

**<Unchanged part skipped>**

Table A.3.2.2.1-1: PDSCH Reference Channel for TDD UL-DL pattern FR1.15-1 and LTE-NR coexistence scenario

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PDSCH.1-1.1 TDD | R.PDSCH.1-1.2 TDD | R.PDSCH.1-1.3 TDD |  |  |
| Channel bandwidth | MHz | 10 | 10 | 20 |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 |  |  |
| Allocated resource blocks | PRBs | 52 | 52 | 106 |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A | N/A | N/A |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} |  | 9 | 11 | 9 |  |  |
| Allocated slots per 2 frames |  | 7 | 7 | 7 |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |
| MCS index |  | 4 | 4 | 13 |  |  |
| Modulation |  | QPSK | QPSK | 16QAM |  |  |
| Target Coding Rate |  | 0.30 | 0.30 | 0.48 |  |  |
| Number of MIMO layers |  | 1 | 1 | 11 |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A | N/A | N/A |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} |  | 12 | 12 | 12 |  |  |
| Overhead for TBS determination |  | 18 | 18 | 18 |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A | N/A | N/A |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 2472 | 3240 | 15880 |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A | N/A | N/A |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 16 | 16 | 24 |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | CBs | N/A | N/A | N/A |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | CBs | 1 | 1 | 2 |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A | N/A | N/A |  |  |
|  For Slots i = 10, 11 | Bits | 7760 | 10256 | 32672 |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,9,12,…,19} | Bits | 8384 | 10880 | 33920 |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 0.865 | 1.134 | 5.558 |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 2 framesNote 3: No user data is scheduled on slots with LTE PBCH/PSS/SSS |

**<End of change 13>**

**<Start of change 14>**

Table A.3.2.2.1-4: PDSCH Reference Channel for TDD CRS interference mitigation for NR scenario

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PDSCH.1-4.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A |  |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,19} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 7 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} |  | N/A |  |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A |  |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 26632 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A |  |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | CBs | N/A |  |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,19} | CBs | 4 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 5) = {2,3,4} for i from {0,…,19} | Bits | N/A |  |  |  |  |
|  For Slots i = 10, 11 | Bits | 47936 |  |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1} for i from {1,…,9,12,…,19} | Bits | 49184 |  |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 9.3212 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 2 framesNote 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cell |

Table A.3.2.2.1-x: PDSCH Reference Channel for TDD CRS interference mitigation for NR scenario for inter-RAT measurement enabled

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PDSCH.1-4.2 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |
| Allocated resource blocks | PRBs | 106 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
|  For Slots i = {2,12,22,32} |  | N/A |  |  |  |  |
|  For Slots i= {0,20} |  | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4}  |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 12 |  |  |  |  |
| Allocated slots per 4 frames |  | 16 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
|  For Slots i = {2,12,22,32} |  | N/A |  |  |  |  |
|  For Slots i= {0,20} |  | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4}  |  | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slots i = {2,12,22,32} | Bits | N/A |  |  |  |  |
|  For Slots i= {0,20} | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4}  | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 26632 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slots i = {2,12,22,32} | Bits | N/A |  |  |  |  |
|  For Slots i= {0,20} | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4}  | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slots i = {2,12,22,32} | CBs | N/A |  |  |  |  |
|  For Slots i= {0,20} | CBs | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | CBs | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4}  | CBs | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,20} |  | 4 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slots i = {2,12,22,32} | Bits | N/A |  |  |  |  |
|  For Slots i= {0,20} | Bits | N/A |  |  |  |  |
| For Slots in meauresment gao i= {1,2,3,4,5,6} | Bits | N/A |  |  |  |  |
| For Slots i, if mod(i, 5) = {3,4}  | Bits | N/A |  |  |  |  |
| For Slots i = {10,11,30,31} | Bits | 47936 |  |  |  |  |
| For Slots i, if mod(i, 5) = {0,1,2} and i≠{0,1,2,11,20,31} | Bits | 49184 |  |  |  |  |
| Max. Throughput averaged over 4frames | Mbps | 11.9844 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 4 framesNote 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cellNote 4: No user data is scheduled on slots used for measurement |

**<End of change 14>**

**<Start of change 15>**

#### A.3.2.2.2 Reference measurement channels for SCS 30 kHz FR1

Table A.3.2.2.2-25 : PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 with overlapping spectrum for LTE and NR

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PDSCH.2-25.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 51 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 20) = {4,5,7,8,9,17,18,19} for i from {0,…,39} |  | N/A |  |  |  |  |
|  For Slot i, if mod(i, 20) = {0,1,2,3,6,10,11,12,13,14,15,16} for i from {1,…,39} |  | 12 |  |  |  |  |
| Allocated slots per 2 frames |  | 23 |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slot 0 and Slot i, if mod(i, 20) = {4,5,7,8,9,17,18,19} for i from {0,…,39} |  | N/A |  |  |  |  |
|  For Slot i, if mod(i, 20) = {0,1,2,3,6,10,11,12,13,14,15,16} for i from {1,…,39} |  | 12 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 20) = {4,5,7,8,9,17,18,19,} for i from {0,…,39} | Bits | N/A |  |  |  |  |
|  For Slot i, if mod(i, 20) = {0,1,2,3,6,10,11,12,13,14,15,16} for i from {1,…,39} | Bits | 12808 |  |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 20) = {4,5,7,8,9,17,18,19,} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slot i, if mod(i, 20) ={0,1,2,3,6,10,11,12,13,14,15,16} for i from {1,…,39} | Bits | 24 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 20) = {4,5,7,8,9,17,18,19} for i from {0,…,39} | CBs | N/A |  |  |  |  |
|  For Slot i, if mod(i, 20) = {0,1,2,3,6,10,11,12,13,14,15,16} for i from {1,…,39} | CBs | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slot 0 and Slot i, if mod(i, 20) = {4,5,7,8,9,17,18,19} for i from {0,…,39} | Bits | N/A |  |  |  |  |
| For Slots i = 10, 11 | Bits | 25704 |  |  |  |  |
|  For Slot i, if mod(i, 20) = {0,1,2,3,6,10,11,12,13,14,15,16} for i from {1,..,9,12,...39} | Bits | 26928 |  |   |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 14.7292 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 40 ms.Note 2: Slot i is slot index per 2 frames.Note 3: No PDSCH data scheduling on slots with LTE PBCH/PSS/SSS. |

Table A.3.2.2.2-26 : PDSCH Reference Channel for TDD UL-DL pattern FR1.30-1 with overlapping spectrum for LTE and NR for inter-RAT measurement enabled

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PDSCH.2-26.1 TDD |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | PRBs | 51 |  |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
|  For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
|  For i,if mod(i,10)=7 and i≠7 |  | 4 |  |  |  |  |
|  For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 12 |  |  |  |  |
| Allocated slots per 4 frames |  |  |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |
| MCS index |  | 13 |  |  |  |  |
| Modulation |  | 16QAM |  |  |  |  |
| Target Coding Rate |  | 0.48 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
|  For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
|  For i,if mod(i,10)=7 and i≠7 |  | 4 |  |  |  |  |
|  For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 12 |  |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
|  For i,if mod(i,10)=7 and i≠7 |  | 8456 |  |  |  |  |
|  For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 12808 |  |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
| For Slots in meauresment gap i= {2,3,4,5,6,7,8,9,10,11,12,13} |  | N/A |  |  |  |  |
|  For i,if mod(i,10)=7 and i≠7 |  | 2 |  |  |  |  |
|  For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 2 |  |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slots i={5,6,16,25,26,36,45,46,56,65,66,76} |  | N/A |  |  |  |  |
| For Slots i={0,40} |  | N/A |  |  |  |  |
| For i,if mod(i,10)={8,9} |  | N/A |  |  |  |  |
|   |  | N/A |  |  |  |  |
|  For i,if mod(i,10)=7 and i≠7 |  | 17808 |  |  |  |  |
|  For i={20,21,60,61} |  | 25704 |  |  |  |  |
|  For i, if mod(I,10)={0,1,2,3,4,5,6} and i ≠{0,2,3,4,5,6,10,11,12,13,16,25,26,36,40,45,46,56,65,66,76} |  | 26928 |  |  |  |  |
| Max. Throughput averaged over 4frames | Mbps | 12.6868 |  |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 4 framesNote 3: No user data is scheduled on slots with PBCH/PSS/SSS on the interference LTE cellNote 4: No user data is scheduled on slots used for measurement |

**<End of change 15>**

**<Start of change 16>**

B.x Interference model for PDSCH requirements with LTE-NR spectrum sharing

This clause provides interference modelling for each explicitly modelled LTE interfering cell. Each interfering cell involved in PDSCH performance requirements for LTE-NR spectrum sharing is characterized by its associated interferer to noise ratio (INR) value as defined in [B.Y.1].

In each subframe, each interfering cell shall transmit 16QAM randomly modulated data over the entire PDSCH region and over the full transmission bandwidth according to the probabilities of occurrence. Transmitted physical channels shall include PSS, SSS and PBCH. Probabilities of occurrence of LTE PDSCH in each subframe are as specified in requirements.

For each subframe, a transmission rank shall be randomly determined independently from interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in requirements.

For each subframe, a precoding matrix for the number of layers  associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of TS 36.211 [15]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is .

Precoding for spatial multiplexing with CRS for the number of antenna ports shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of TS 36.211 [15] with the selected precoding matrices for each subframe.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the simulation scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of TS 36.211 [15]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2 of TS 36.101 [4].

**<End of change 16>**