**3GPP TSG-RAN4 Meeting #102-e *R4-2207232***

 **Online, 21st Feb 2022 - 3rd Mar 2022**

|  |
| --- |
| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-4** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.3.0** |  |
|  |
| *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)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | Big draftCR for 38.101-4: FR2 HST |
|  |  |
| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_HST\_FR2-Perf  |  | ***Date:*** | 2022-03-07 |
|  |  |  |  |  |
| ***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:*** | Introduce UE PDSCH demodulation requirement for Rel-17 FR2 HST |
|  |  |
| ***Summary of change:*** | Add Rel-17 FR2 HST UE demodulation requirement based on the endorsed draft CRs in RAN4#102-e meeting- R4-2207226: Draft CR on minimum requirements for PDSCH HST-DPS (38.101-4)- R4-2207228: Draft CR to TS 38.101-4: Applicability rules for HST FR2 PDSCH requirements- R4-2207229: draft CR: FRC for PDSCH demodulation requirement for FR2 HST  |
|  |  |
| ***Consequences if not approved:*** | Miss the UE demoduoiation requirement for Rel-17 FR2 HST |
|  |  |
| ***Clauses affected:*** | 7.1.1, 7.2.2.2.4, A.3.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR … CR …  |
| ***affected:*** | **x** |  |  Test specifications | TS 38.524 |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR … CR …  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR’s revision history:*** |  |

<Start of Change 1>

### 7.1.1 Applicability of requirements

#### 7.1.1.1 General

The minimum performance requirements are applicable to the FR2 operating bands defined in TS 38.101-2 [7] with FDL\_high not exceeding 48200 MHz. Additional applicability rules for certain operating bands are specified in Clause 7.1.1.6.

The minimum performance requirements in Clause 7 are mandatary for UE supporting NR operation, except test cases listed in Clause 7.1.1.3, 7.1.1.4, 7.1.1.5.

If same test is listed for different UE features/capabilities in Clauses 7.1.1.3 and 7.1.1.4, then this test shall apply for UEs which support all corresponding UE features/capabilities.

#### 7.1.1.2 Applicability of requirements for different number of RX antenna ports

UE shall support 2 RX ports for different RF operating bands. The UE requirements applicability is defined in Table 7.1.1.2-1.

Table 7.1.1.2-1: Requirements applicability

|  |  |  |
| --- | --- | --- |
| **Supported RX antenna ports** | **Test type** | **Test list** |
| UE supports 2RX antenna ports | PDSCH | All tests in Clause 7.2.2 |
| PDCCH | All tests in Clause 7.3.2 |
| PBCH | All tests in Clause 7.4.2 |

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

The performance requirements in Table 7.1.1.3-1 shall apply for UEs which support optional UE features only.

Table 7.1.1.3-1: Requirements applicability for optional UE features

|  |  |  |  |
| --- | --- | --- | --- |
| UE feature/capability [14] | Test type | Test list | Applicability notes |
| SU-MIMO Interference Mitigation advanced receiver | FR2 TDD | PDSCH | Clause 7.2.2.2.1 (Test 3-1) |  |
| Basic DL NR-NR CA operation (*supportedBandCombinationList*) | NR CA | SDR | Clause 7.5A.1 | 1) Up to 16 DL carriers2) Same numerology across carrier for data/control channel at a given time |
| PDSCH repetitions over multiple slots *(pdsch-RepetitionMultiSlots)* | FR2 TDD | PDSCH | Clause 7.2.2.2.2 |  |
| DRX Adaptation (*drx-Adaptation-r16*) | FR2 TDD | PDCCH | Clause 7.3.2.2.3 | If the Test 3-1 in Clause 7.3.2.2.3 is passed, the test coverage can be considered fulfilled without executing Test 1-2 in clause 7.3.2.2.1. |
| 256QAM for PDSCH(*pdsch-256QAM-FR2*) | FR2 TDD | PDSCH | Clause 7.2.2.2.1 (Test 1-4) |  |
| 256QAM for PDSCH (*pdsch-256QAM-FR2*) | FR2 TDD | SDR | Clause 7.5A.1 | For UE capable of *pdsch-256QAM-FR2* for certain band(s), *mcs-Table* is configured to ‘64QAM’ for SDR test. |
| Support of FR2 HST operation [(FR2 UE power class PC6 signalling is used to indicate support of feature group)] | FR2 TDD | PDSCH | Clause 7.2.2.2.4 |  |

7.1.1.4 Applicability of requirements for mandatory UE features with capability signalling

The performance requirements in Table 7.1.1.4-1 shall apply for UEs which support mandatory UE features with capability signalling only.

Table 7.1.1.4-1: Requirements applicability for mandatory features with UE capability signalling

|  |  |  |  |
| --- | --- | --- | --- |
| UE feature/capability [14] | Test type | Test list | Applicability notes |
| Supported maximum number of PDSCH MIMO layers (*maxNumberMIMO-LayersPDSCH)* | FR2 TDD | PDSCH | Clause 7.2.2.2.1 (Tests from 2-1 to 2-6) | The requirements apply only in case the PDSCH MIMO rank in the test case does not exceed UE PDSCH MIMO layers capability |
| Support of PT-RS with one antenna port for DL reception (*onePortsPTRS*) | FR2 TDD | PDSCH | Clause 7.2 |  |
| SDR | Clause 7.5.1Clause 7.5A.1 |
| PCell operation on FR2 (*pCell-FR2*) | FR2 TDD | SDR | Clause 7.5A.1 |  |
| PDSCH mapping type B (*pdsch-MappingTypeB*) | FR2 TDD | PDSCH | Clause 7.2.2.2.3 |  |
| Support number of active TCI states per BWP per CC, including control and data (maxNumberActiveTCI-PerBWP) | FR2 TDD | PDSCH | Clause 7.2.2.2.4 (Test 1-2) | The requirements apply only when maxNumberActiveTCI-PerBWP is other than n1. |

#### 7.1.1.5 Applicability of CA requirements

##### 7.1.1.5.1 Definition of CA capability

The definition with respect to CA capabilities is given as in Table 7.1.1.5.1-1.

Table 7.1.1.5.1-1: Definition of CA capability

|  |  |
| --- | --- |
| CA Capability | CA Capability Description |
| CA\_C | Intra-band contiguous CA |
| CA\_N | Intra-band non-contiguous CA |
| CA\_AX | Inter-band CA (X bands)  |
| NOTE 1: CA\_C corresponds to NR CA configurations and bandwidth combination sets defined in Clause 5.5A.1 of TS 38.101-2 [7].CA\_N corresponds to NR CA configurations and bandwidth combination sets defined in Clause 5.5A.2 of TS 38.101-2 [7].CA\_AX corresponds to NR CA configurations and bandwidth combination sets defined in Clause 5.5A.3 of TS 38.101-2 [7]. |

##### 7.1.1.5.2 Applicability and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA UE demodulation tests in Clause 7.2A are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.5A of TS 38.101-2. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined in Table 7.1.1.5.2-1 and Table 7.1.1.5.2-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

Table 7.1.1.5.2-1: Applicability and test rules for CA UE demodulation tests

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order | PCell CC configuration |
| Test 1 in Clause 7.2A.2.1 | CA\_C, CA\_N, CA\_AX | Table 7.1.1.5.2-2 | Largest aggregated CA bandwidth combination | Any of CCs |

Table 7.1.1.5.2-2: Selection of CA configurations

|  |  |  |  |
| --- | --- | --- | --- |
| CA capability | Step 1 | Step 2 | Step 3 |
| CA\_C or CA\_N or CA\_AX | Select CA configuration(s), which contain all CA bandwidth combinations requiring SNR below test equipment maximum achievable SNR | Select the CA configurations with the maximum number of CCs, for which the supported maximum number of MIMO layers is not lower than 2, among all the selected CA configurations from Step 1. | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 2. |
| NOTE 1: Maximum supported data rate for Step 3 is calculated based clause 4.1.2 of TS 38.306 [14]NOTE 2: Tested data rate for Step 3 is calculated based on the equation and FRCs used in the test. |

#### 7.1.1.6 Applicability of requirements for operating bands

The applicability rules for FR2 operating bands are specified in Table 7.1.1.6-1.

Table 7.1.1.6-1: Requirements applicability for operating bands

|  |  |  |
| --- | --- | --- |
| Test type | Test list | Applicability notes |
| FR2 TDD | PDSCH | Clause 7.2.2.2.1 (Test 1-4) | The requirements are applicable for bands with FDL\_high higher than 40000 MHz and lower than 48200 MHz with additional margin as 1.5 dB. |
| FR2 TDD | PDSCH | Clause 7.2.2.2.1 (Test 2-6)Clause 7.2.2.2.1 (Test 3-1) | The requirements are applicable for bands with FDL\_high higher than 40000 MHz and lower than 48200 MHz with additional margin as 0.5 dB. |

<End of Change 1>

<Start of Change 2>

### 7.2.2 2RX requirements

#### 7.2.2.1 FDD

(Void)

#### 7.2.2.2 TDD

7.2.2.2.4 Minimum requirements for HST-DPS

The performance requirements are specified in Table 7.2.2.2.4-3, with the addition of test parameters in Table 7.2.2.2.4-2 and the downlink physical channel setup according to Annex C.5.1.

The test purposes are specified in Table 7.2.2.2.4-1.

**Table 7.2.2.2.4-1: Tests purpose**

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify UE performance in the HST-DPS scenario defined in B.3.3 | 1-1, 1-2 |

**Table 7.2.2.2.4-2: Test parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Duplex mode |  | TDD |
| Active DL BWP index |  | 1 |
| PDCCH configuration | TCI state |  |  Note 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S) |  | 1 |
| Length (L) |  | Specific to each Reference channel |
| 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 |
| TCI state |  | Note 1 |
| PDSCH DMRS configuration | DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 2 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| CSI-RS for tracking | Resource set #1 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 2 |
| l0 = 9 for CSI-RS resource 3 and 4 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 1 and 2 |
| 3 for CSI-RS resource 3 and 4 |
| QCL info |  | TCI state #4 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #2 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 0 for CSI-RS resource 5,6,7,8 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 4 for CSI-RS resource 5 and 6 |
| l0 = 8 for CSI-RS resource 7 and 8 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 5,6,7,8 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 5 and 6 |
| 3 for CSI-RS resource 7 and 8 |
| QCL info |  | TCI state #5 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #3 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 1 for CSI-RS resource 9,10,11,12 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 5 for CSI-RS resource 9 and 10 |
| l0 = 9 for CSI-RS resource 11 and 12 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 9,10,11,12 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 9 and 10 |
| 3 for CSI-RS resource 11 and 12 |
| QCL info |  | TCI state #6 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #4 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 1 for CSI-RS resource 13,14,15,16 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 4 for CSI-RS resource 13 and 14 |
| l0 = 8 for CSI-RS resource 15 and 16 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 13,14,15,16 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 13 and 14 |
| 3 for CSI-RS resource 15 and 16 |
| QCL info |  | TCI state #7 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #13 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 2 for CSI-RS resource 17,18,19,20 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 5 for CSI-RS resource 17 and 18 |
| l0 = 9 for CSI-RS resource 19 and 20 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 17,18,19,20 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 17 and 18 |
| 3 for CSI-RS resource 19 and 20 |
| QCL info |  | TCI state #12 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #14 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 2 for CSI-RS resource 21,22,23,24 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 4 for CSI-RS resource 21 and 22 |
| l0 = 8 for CSI-RS resource 23 and 24 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 21,22,23,24 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 21 and 22 |
| 3 for CSI-RS resource 23 and 24 |
| QCL info |  | TCI state #13 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #15 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 3 for CSI-RS resource 25,26,27,28 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 5 for CSI-RS resource 25 and 26 |
| l0 = 9 for CSI-RS resource 27 and 28 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 25,26,27,28 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 25 and 26 |
| 3 for CSI-RS resource 27 and 28 |
| QCL info |  | TCI state #14 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| Resource set #16 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 3 for CSI-RS resource 29,30,31,32 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 4 for CSI-RS resource 29 and 30 |
| l0 = 8 for CSI-RS resource 31 and 32 |
| CSI-RS periodicity | Slots | 80 for CSI-RS resource 29,30,31,32 |
| CSI-RS offset | Slots | 2 for CSI-RS resource 29 and 30 |
| 3 for CSI-RS resource 31 and 32 |
| QCL info |  | TCI state #15 |
| Frequency Occupation |  | Start PRB 0 |
| Number of PRB =ceil(BWP size/4)\*4 |
| NZP CSI-RS for CSI acquisition | Resource set #5 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 0 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 12 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #0 |
| Resource set #6 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 2 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 12 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #1 |
| Resource set #7 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 12 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #2 |
| Resource set #8 | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 6 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 12 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #3 |
| Resource set #17 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 0 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 13 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #8 |
| Resource set #18 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 2 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 13 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #9 |
| Resource set #19 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 13 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #10 |
| Resource set #20 (Note2) | First subcarrier index in the PRB used for CSI-RS (*k0*) |  | 6 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 13 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #11 |
| CSI-RS for beam refinement | Resource set #9 | First subcarrier index in the PRB used for CSI-RS  |  | k0=0 for CSI-RS resource 1,2 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 8 for CSI-RS resource 1l0 = 9 for CSI-RS resource 2 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #0 |
| Resource set #10 | First subcarrier index in the PRB used for CSI-RS  |  | k0=1 for CSI-RS resource 3,4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 8 for CSI-RS resource 3l0 = 9 for CSI-RS resource 4 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #1 |
| Resource set #11 | First subcarrier index in the PRB used for CSI-RS  |  | k0=2 for CSI-RS resource 5,6 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 8 for CSI-RS resource 5l0 = 9 for CSI-RS resource 6 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #2 |
| Resource set #12 | First subcarrier index in the PRB used for CSI-RS  |  | k0=3 for CSI-RS resource 7,8 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 8 for CSI-RS resource 7l0 = 9 for CSI-RS resource 8 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 0 |
| QCL info |  | TCI state #3 |
| Resource set #21 (Note2) | First subcarrier index in the PRB used for CSI-RS  |  | k0=0 for CSI-RS resource 9,10 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 10 for CSI-RS resource 9l0 = 11 for CSI-RS resource 10 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #8 |
| Resource set #22 (Note2) | First subcarrier index in the PRB used for CSI-RS  |  | k0=1 for CSI-RS resource 11,12 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 10 for CSI-RS resource 11l0 = 11 for CSI-RS resource 12 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #9 |
| Resource set #23 (Note2) | First subcarrier index in the PRB used for CSI-RS  |  | k0=2 for CSI-RS resource 13,14 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 10 for CSI-RS resource 13l0 = 11 for CSI-RS resource 14 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #10 |
| Resource set #24 (Note2) | First subcarrier index in the PRB used for CSI-RS  |  | k0=3 for CSI-RS resource 15,16 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 10 for CSI-RS resource 15l0 = 11 for CSI-RS resource 16 |
| CSI-RS periodicity | Slots | 160 |
| CSI-RS offset | Slots | 1 |
| QCL info |  | TCI state #11 |
| TCI state #0 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking Resource set #1' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking Resource set #1' configuration |
| QCL Type |  | Type D |
| TCI state #1 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 5 from 'CSI-RS for tracking Resource set #2' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 5 from 'CSI-RS for tracking Resource set #2' configuration |
| QCL Type |  | Type D |
| TCI state #2 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 9 from 'CSI-RS for tracking Resource set #3' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 9 from 'CSI-RS for tracking Resource set #3' configuration |
| QCL Type |  | Type D |
| TCI state #3 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 13 from 'CSI-RS for tracking Resource set #4' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 13 from 'CSI-RS for tracking Resource set #4' configuration |
| QCL Type |  | Type D |
| TCI state #8 (Note2) | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 17 from 'CSI-RS for tracking Resource set #13' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 17 from 'CSI-RS for tracking Resource set #13' configuration |
| QCL Type |  | Type D |
| TCI state #9 (Note2) | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 21 from 'CSI-RS for tracking Resource set #14' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 21 from 'CSI-RS for tracking Resource set #14' configuration |
| QCL Type |  | Type D |
| TCI state #10 (Note2) | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 25 from 'CSI-RS for tracking Resource set #15' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 25 from 'CSI-RS for tracking Resource set #15' configuration |
| QCL Type |  | Type D |
| TCI state #11 (Note2) | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 29 from 'CSI-RS for tracking Resource set #16' configuration |
| QCL Type |  | Type A |
| Type 2 QCL information | CSI-RS resource |  | CSI-RS resource 29 from 'CSI-RS for tracking Resource set #16' configuration |
| QCL Type |  | Type D |
| TCI state #4 | Type 1 QCL information | SSB index |  | SSB #0 |
| QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #0 |
| QCL Type |  | Type D |
| TCI state #5 | Type 1 QCL information | SSB index |  | SSB #1 |
| QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #1 |
| QCL Type |  | Type D |
| TCI state #6 | Type 1 QCL information | SSB index |  | SSB #2 |
|  | QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #2 |
|  | QCL Type |  | Type D |
| TCI state #7 | Type 1 QCL information | SSB index |  | SSB #3 |
|  | QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #3 |
|  | QCL Type |  | Type D |
| TCI state #12 (Note2) | Type 1 QCL information | SSB index |  | SSB #4 |
|  | QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #4 |
|  | QCL Type |  | Type D |
| TCI state #13 (Note2) | Type 1 QCL information | SSB index |  | SSB #5 |
|  | QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #5 |
|  | QCL Type |  | Type D |
| TCI state #14 (Note2) | Type 1 QCL information | SSB index |  | SSB #6 |
|  | QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #6 |
|  | QCL Type |  | Type D |
| TCI state #15 (Note2) | Type 1 QCL information | SSB index |  | SSB #7 |
|  | QCL Type |  | Type C |
| Type 2 QCL information | SSB index |  | SSB #7 |
|  | QCL Type |  | Type D |
| 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.1.3 |
| Note 1: For Test 1-1, SSB # (2k mod 8) , CSI-RS (for tracking) resource set # ((k mod 4)+1), CSI-RS (for CSI acquisition) resource set # ((k mod 4) + 5) and CSI-RS (for beam refinement) resource set # ((k mod 4) + 9) are transmitted by kth RRH; SSB # ((2k mod 8)+1) , CSI-RS (for tracking) resource set # ((k mod 4) + 13), CSI-RS (for CSI acquisition) resource set # ((k mod 4) + 17) and CSI-RS (for beam refinement) resource set # ((k mod 4) + 21) are transmitted by kth RRH. TCI state switching command scheduled by MAC CE with MCS 4 is transmitted in slot #i that satisfy (i≠0). PDCCH and PDSCH associated with TCI # (2k mod 8) is transmitted by kth RRH from slot#to slot#,PDCCH and PDSCH associated with TCI # ((2k+1) mod 8) is transmitted by kth RRH from slot#to slot#],Where k=0, 1, 2… is the RRH number, n = 28800 is half of the number of slots between two RRH, = 4 is the number of slots between PDSCH and corresponding HARQ-ACK information, = 24 is the number of slots for MAC CE processing, = 132 is the number of slots to first SSB transmission occasion after MAC CE command is decoded by the UE, = 16 is the number of slots for SSB processing, = 66 is the number of slots to first TRS transmission occasion after first SSB is processed by the UE, = 16 is the number of slots for TRS processing. PDCCH and PDSCH are DTXed in other slots in which throughput statistics are not considered.For Test 1-2, SSB # (k mod 4) , CSI-RS (for tracking) resource set # ((k mod 4)+1), CSI-RS (for CSI acquisition) resource set # ((k mod 4) + 5) and CSI-RS (for beam refinement) resource set # ((k mod 4) + 9) are transmitted by kth RRH. TCI state switching command scheduled by MAC CE with MCS 4 is transmitted in slot #i that satisfy. PDCCH and PDSCH associated with TCI # (k mod 4) is transmitted by kth RRH from slot#to slot#]Where k=0, 1, 2… is the RRH number, n = 57600 is half of the number of slots between two RRH,  = 4 is the number of slots between PDSCH and corresponding HARQ-ACK information, = 24 is the number of slots for MAC CE processing.Note 2: Only configured for Test 1-2. |

**Table 7.2.2.2.4-3: Minimum performance for HST-DPS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **Propagation condition** | **Number of active PDSCH TCI states** | **Correlation matrix and antenna configuration** | **Reference value** |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | [R.PDSCH.5-X.1 TDD] | 200 / 120 | 64QAM, 0.43 | HST-DPS-FR2-BI-B | 1 | 2x2 | 70 | TBD |
| 1-2 | [R.PDSCH.5-X.2 TDD] | 200 / 120 | 64QAM, 0.43 | HST-DPS-FR2-UNI-A | 2 | 2x2 | 70 | TBD |

<End of Change 2>

<Start of Change 3>

#### A.3.2.2.5 Reference measurement channels for SCS 120 kHz FR2

Table A.3.2.2.5-12: PDSCH Reference Channel for TDD UL-DL pattern FR2.120-1 and HST-DPS scenario

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | R.PDSCH.5-12.1 TDD | R.PDSCH.5-12.2 TDD |  |  |  |
| Channel bandwidth | MHz | 200 | 200 |  |  |  |
| Subcarrier spacing | kHz | 120 | 120 |  |  |  |
| Allocated resource blocks | PRBs | 132 | 132 |  |  |  |
| Number of consecutive PDSCH symbols |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A |  |  |  |
|  For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 9 | 9 |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 13 | 13 |  |  |  |
| Allocated slots per 2 frames |  | 127 | 126 |  |  |  |
| MCS table |  | 64QAM | 64QAM |  |  |  |
| MCS index |  | 17 | 17 |  |  |  |
| Modulation |  | 64QAM | 64QAM |  |  |  |
| Target Coding Rate |  | 0.43 | 0.43 |  |  |  |
| Number of MIMO layers |  | 2 | 2 |  |  |  |
| Number of DMRS REs |  |  |  |  |  |  |
| For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} |  | N/A | N/A |  |  |  |
|  For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} |  | 12 | 12 |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} |  | 18 | 18 |  |  |  |
|  For Slot i = 1 |  | 18 | N/A (Note 4) |  |  |  |
| Overhead for TBS determination |  | 6 | 6 |  |  |  |
| Information Bit Payload per Slot  |  |  |  |  |  |  |
|  For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
|  For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 61480 | 61480 |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 90176 | 90176 |  |  |  |
|  For Slot i = 1 |  | 90176 | N/A (Note 4) |  |  |  |
| Transport block CRC per Slot |  |  |  |  |  |  |
|  For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
|  For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 24 | 24 |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | Bits | 24 | 24 |  |  |  |
|  For Slot i = 1 |  | 24 | N/A (Note 4) |  |  |  |
| Number of Code Blocks per Slot |  |  |  |  |  |  |
|  For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | CBs | N/A | N/A |  |  |  |
|  For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | CBs | 8 | 8 |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {1,…,159} | CBs | 11 | 11 |  |  |  |
|  For Slot i = 1 |  | 11 | N/A (Note 4) |  |  |  |
| Binary Channel Bits Per Slot |  |  |  |  |  |  |
|  For Slots 0 and Slot i, if mod(i, 5) = 4 for i from {0,…,159} | Bits | N/A | N/A |  |  |  |
|  For Slots i = 2 and 82 (Note 3) | Bits | 195696 | 180720 |  |  |  |
|  For Slots i = 3 and 83 (Note 3) | Bits | 131544 | 116568 |  |  |  |
|  For Slot i, if mod(i, 5) = 3 for i from {0,…, 159} | Bits | 146520 | 146520 |  |  |  |
|  For Slot i, if mod(i, 5) = {0,1,2} for i from {2,…,79,82,…,159} | Bits | 210672 | 210672 |  |  |  |
|  For Slot i = 1 | Bits | 210672 | N/A (Note 4) |  |  |  |
| Max. Throughput averaged over 2 frames | Mbps | 526.704 | 522.195 |  |  |  |
| Note 1: SS/PBCH block is transmitted in slot #0 with periodicity 20 msNote 2: Slot i is slot index per 2 framesNote 3: Binary Channel Bits are calculated under assumption of 52 PRBs TRS allocation when the number of allocated resource blocks are more than 52.Note 4: SS/PBCH block is transmitted in slot #1 with periodicity 20ms |

<End of Change 3>