**3GPP TSG-RAN WG4 Meeting #97-e *R4-2017532***

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

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-4** | **CR** | **<CR#>** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  |
| *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:***  | DraftCR for 38.101-4:  |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_eMIMO-Perf  |  | ***Date:*** | 2020-11-11 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | RAN4 agrees to introduce PDSCH requirements of Single-DCI based SDM scheme and the aligned requirements need to be added into the specfication |
|  |  |
| ***Summary of change:*** | Introduce PDSCH requirements of Single-DCI based SDM scheme |
|  |  |
| ***Consequences if not approved:*** | PDSCH requirements of Single-DCI based SDM scheme are missing |
|  |  |
| ***Clauses affected:*** | 5.2.2.1.5, 5.2.2.2.5, 5.2.3.1.5, 5.2.3.2.5 |
|  |  |
|  | **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 CR's revision history:*** | Revised from R4-2015653 |

**<Start of First change>**

##### 5.2.2.1.11 Minimum requirements for PDSCH Single-DCI based SDM scheme

The performance requirements are specified in Table 5.2.2.1.11-3, with the addition of test parameters in Table 5.2.2.1.11-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.1.11-1.

Table 5.2.2.1.11-1: Tests purpose

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH performance with Single-DCI based SDM scheme of Multi-TRP under 2 receive antenna conditions | 1-1,1-2 |

Table 5.2.2.1.11-2: Test parameters

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **TRP #1** | **TRP #2** |
| Transmit TRP of SSB |  | TRP #1 |
| PDCCH configuration | TCI state |  | [TCI State #1] |
| CORESETPoolIndex |  | 0 |
| CSI-RS for tracking | First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resources 1,2,3,4 | k0=1 for CSI-RS resources 1,2,3,4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 5,6,7,8 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4,5,6,7,8 |
| Density |  | 3 |
| CSI-RS periodicity | Slots | 20 |
| CSI-RS offset | Slots | 10 for CSI-RS resources 1 and 211 for CSI-RS resources 3 and 4 | 10 for CSI-RS resources 1 and 211 for CSI-RS resources 3 and 4 |
| QCL info |  | TCI state #0 |
| Duplex mode |  | FDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S)  |  | 2 |
| Length (L) |  | 12 |
| PRB bundling type |  | Static |
| PRB bundling size |  | [2] |
| Resource allocation type |  | Type 1 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | Antenna port indexes |  | 1000  | 1002 |
| TCI state |  | TCI State #1 | TCI State #2 |
| DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| TCI State #1 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking’ configuration | N/A |
| QCL Type |  | Type A | N/A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| TCI State #2 | Type 1 QCL information | CSI-RS resource |  | N/A | CSI-RS resource 5 from 'CSI-RS for tracking’ configuration |
| QCL Type |  | N/A | Type A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| Resource allocation |  | Full-overlapping |
| Timing offset of the second TRP from the first TRP | us | -0.5 for test 1-12 for test 1-2 |
| Frequency offset of the second TRP from the first TRP | Hz | 200 for test 1-10 for test 1-2 |
| Number of HARQ Processes |  | 4  |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | 2 |

Table 5.2.2.1.11-3: Minimum performance

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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.1-3.2 FDD] | 10 / 15 | 64QAM, 0.50 | TDLA30-10 for each TRP | 2x2, ULA Low for each TRP | 70 | TBD |
| 1-2 | [R.PDSCH.1-3.2 FDD] | 10 / 15 | 64QAM, 0.50 | TDLA30-10 for each TRP | 2x2, ULA Low for each TRP | 70 | TBD |

**<end of First change>**

**<Start of Second change>**

##### 5.2.2.2.11 Minimum requirements for PDSCH Single-DCI based SDM scheme

The performance requirements are specified in Table 5.2.2.2.11-3, with the addition of test parameters in Table 5.2.2.2.11-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.2.11-1.

Table 5.2.2.2.11-1: Tests purpose

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH performance with Single-DCI based SDM scheme of Multi-TRP under 2 receive antenna conditions. | 1-1,1-2 |

Table 5.2.2.2.11-2: Test parameters

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **TRP #1** | **TRP #2** |
| Transmit TRP of SSB |  | TRP #1 |
| PDCCH configuration | TCI state |  | [TCI State #1] |
| CORESETPoolIndex |  | 0 |
| CSI-RS for tracking | First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resources 1,2,3,4 | k0=1 for CSI-RS resources 1,2,3,4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 5,6,7,8 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4,5,6,7,8 |
| Density |  | 3 |
| CSI-RS periodicity | Slots | 40 |
| CSI-RS offset | Slots | 20 for CSI-RS resources 1 and 221 for CSI-RS resources 3 and 4 | 20 for CSI-RS resources 1 and 221 for CSI-RS resources 3 and 4 |
| QCL info |  | TCI state #0 |
| Duplex mode |  | TDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S)  |  | 2 |
| Length (L) |  | 12 |
| PRB bundling type |  | Static |
| PRB bundling size |  | [2] |
| Resource allocation type |  | Type 1 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | Antenna port indexes |  | 1000  | 1002 |
| TCI state |  | TCI State #1 | TCI State #2 |
| DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| TCI State #1 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking’ configuration | N/A |
| QCL Type |  | Type A | N/A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| TCI State #2 | Type 1 QCL information | CSI-RS resource |  | N/A | CSI-RS resource 5 from 'CSI-RS for tracking’ configuration |
| QCL Type |  | N/A | Type A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| Resource allocation |  | Full-overlapping |
| Timing offset of the second TRP from the first TRP | us | -0.25 for test 1-11 for test 1-2 |
| Frequency offset of the second TRP from the first TRP | Hz | 300 for test 1-10 for test 1-2 |
| 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 5.2.2.2.11-3: Minimum performance

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 of maximum throughput (%) | SNR (dB) |
| 1-1 | [R.PDSCH.2-3.2 TDD] | 40 / 30 | 64QAM, 0.50 | FR1.30-1 | TDLA30-10 for each TRP | 2x2, ULA Low for each TRP | 70 | TBD |
| 1-2 | [R.PDSCH.2-3.2 TDD] | 40 / 30 | 64QAM, 0.50 | FR1.30-1 | TDLA30-10 for each TRP | 2x2, ULA Low for each TRP | 70 | TBD |

**<end of Second change>**

**<Start of Third change>**

##### 5.2.3.1.11 Minimum requirements for PDSCH Single-DCI based SDM scheme

The performance requirements are specified in Table 5.2.3.1.11-3, with the addition of test parameters in Table 5.2.3.1.11-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.1.11-1.

Table 5.2.3.1.11-1: Tests purpose

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH performance with Single-DCI based SDM scheme of Multi-TRP | 1-1,1-2 |

Table 5.2.3.1.11-2: Test parameters

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **TRP #1** | **TRP #2** |
| Transmit TRP of SSB |  | TRP #1 |
| PDCCH configuration | TCI state |  | [TCI State #1] |
| CORESETPoolIndex |  | 0 |
| CSI-RS for tracking | First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resources 1,2,3,4 | k0=1 for CSI-RS resources 1,2,3,4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 5,6,7,8 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4,5,6,7,8 |
| Density |  | 3 |
| CSI-RS periodicity | Slots | 20 |
| CSI-RS offset | Slots | 10 for CSI-RS resources 1 and 211 for CSI-RS resources 3 and 4 | 10 for CSI-RS resources 1 and 211 for CSI-RS resources 3 and 4 |
| QCL info |  | TCI state #0 |
| Duplex mode |  | FDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S)  |  | 2 |
| Length (L) |  | 12 |
| PRB bundling type |  | Static |
| PRB bundling size |  | [2] |
| Resource allocation type |  | Type 1 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | Antenna port indexes |  | 1000  | 1002 |
| TCI state |  | TCI State #1 | TCI State #2 |
| DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| TCI State #1 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking’ configuration | N/A |
| QCL Type |  | Type A | N/A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| TCI State #2 | Type 1 QCL information | CSI-RS resource |  | N/A | CSI-RS resource 5 from 'CSI-RS for tracking’ configuration |
| QCL Type |  | N/A | Type A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| Resource allocation |  | Full-overlapping |
| Timing offset of the second TRP from the first TRP | us | -0.5 for test 1-12 for test 1-2 |
| Frequency offset of the second TRP from the first TRP | Hz | 200 for test 1-10 for test 1-2 |
| Number of HARQ Processes |  | 4  |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | 2 |

Table 5.2.3.1.11-3: Minimum performance

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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.1-3.2 FDD] | 10 / 15 | 64QAM, 0.50 | TDLA30-10 for each TRP | 2x4, ULA Low for each TRP | 70 | TBD |
| 1-2 | [R.PDSCH.1-3.2 FDD] | 10 / 15 | 64QAM, 0.50 | TDLA30-10 for each TRP | 2x4, ULA Low for each TRP | 70 | TBD |

**<end of third change>**

**<Start of Forth change>**

##### 5.2.3.2.11 Minimum requirements for PDSCH Single-DCI based SDM scheme

The performance requirements are specified in Table 5.2.3.2.11-3, with the addition of test parameters in Table 5.2.3.2.11-2 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.2.11-1.

Table 5.2.3.2.11-1: Tests purpose

|  |  |
| --- | --- |
| **Purpose** | **Test index** |
| Verify the PDSCH performance with Single-DCI based SDM scheme of Multi-TRP under 4 receive antenna conditions. | 1-1,1,2 |

Table 5.2.3.2.11-2: Test parameters

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **TRP #1** | **TRP #2** |
| Transmit TRP of SSB |  | TRP #1 |
| PDCCH configuration | TCI state |  | [TCI State #1] |
| CORESETPoolIndex |  | 0 |
| CSI-RS for tracking | First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resources 1,2,3,4 | k0=1 for CSI-RS resources 1,2,3,4 |
| First OFDM symbol in the PRB used for CSI-RS |  | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3l0 = 10 for CSI-RS resources 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 5,6,7,8 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4,5,6,7,8 |
| Density |  | 3 |
| CSI-RS periodicity | Slots | 40 |
| CSI-RS offset | Slots | 20 for CSI-RS resources 1 and 221 for CSI-RS resources 3 and 4 | 20 for CSI-RS resources 1 and 221 for CSI-RS resources 3 and 4 |
| QCL info |  | TCI state #0 |
| Duplex mode |  | TDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S)  |  | 2 |
| Length (L) |  | 12 |
| PRB bundling type |  | Static |
| PRB bundling size |  | [2] |
| Resource allocation type |  | Type 1 |
| RBG size |  | Config2 |
| VRB-to-PRB mapping type |  | Non-interleaved |
| VRB-to-PRB mapping interleaver bundle size |  | N/A |
| PDSCH DMRS configuration | Antenna port indexes |  | 1000  | 1002 |
| TCI state |  | TCI State #1 | TCI State #2 |
| DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| TCI State #1 | Type 1 QCL information | CSI-RS resource |  | CSI-RS resource 1 from 'CSI-RS for tracking’ configuration | N/A |
| QCL Type |  | Type A | N/A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| TCI State #2 | Type 1 QCL information | CSI-RS resource |  | N/A | CSI-RS resource 5 from 'CSI-RS for tracking’ configuration |
| QCL Type |  | N/A | Type A |
| Type 2 QCL information | CSI-RS resource |  | N/A | N/A |
| QCL Type |  | N/A | N/A |
| Resource allocation |  | Full-overlappling |
| Timing offset of the second TRP from the first TRP | us | -0.25 for test 1-11 for test 1-2 |
| Frequency offset of the second TRP from the first TRP | Hz | 300 for test 1-10 for test 1-2 |
| 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 5.2.3.2.11-3: Minimum performance

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 of maximum throughput (%) | SNR (dB) |
| 1-1 | [R.PDSCH.2-3.2 TDD] | 40 / 30 | 64QAM, 0.50 | FR1.30-1 | TDLA30-10 for each TRP | 2x4, ULA Low for each TRP | 70 | TBD |
| 1-2 | [R.PDSCH.2-3.2 TDD] | 40 / 30 | 64QAM, 0.50 | FR1.30-1 | TDLA30-10 for each TRP | 2x4, ULA Low for each TRP | 70 | TBD |

**<end of forth change>**