**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | Finalize PDSCH requirements of MU-MIMO advanced receiver 2Rx and 4Rx TDD |
|  |  |
| ***Summary of change:*** | Modify existing test• Modify Chapter 5.2.2.2.17• Modify Chapter 5.2.3.2.17 |
|  |  |
| ***Consequences if not approved:*** | PDSCH requirements of MU-MIMO advanced receiver 2Rx and 4Rx TDD would not be complete |
|  |  |
| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.521-4 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revision of R4-2412327 |

**START OF CHANGE 1**

##### 5.2.2.2.17 Minimum requirements for PDSCH with intra cell inter user interference

The performance requirements are specified in Table 5.2.2.2.17-3, with the addition of test parameters in Table 5.2.2.2.17-2 and the downlink physical channel setup according to Annex C.3.1.

The performance requirements for UE supporting Enhanced Receiver Type 2 are specified in Table 5.2.2.2.17-5, with the addition of test parameters in Table 5.2.2.2.17-2 and Table 5.2.2.2.17-4, and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.2.2.17-1.

Table 5.2.2.2.17-1: Tests purpose

|  |  |
| --- | --- |
| Purpose | Test index |
| Verify the PDSCH performance under 2 receive antenna conditions when the PDSCH transmission of target UE is interfered by co-scheduled UE  | 1-1  |
| Verify PDSCH performance under 2 receive antenna conditions, when the PDSCH transmission of target UE is interfered by co-scheduled UE with Enhanced Receiver Type 2 when modulation order for co-scheduled UE is explicitly signaled by DCI. | 2-1 |
| Verify PDSCH performance under 2 receive antenna conditions, when the PDSCH transmission of target UE is interfered by co-scheduled UE with Enhanced Receiver Type 2 when modulation order for co-scheduled UE is detected. | 2-2 |

Table 5.2.2.2.17-2: Test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Target UE | Co-scheduled UE |
| 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 |
| Antenna ports indexes |  | 1000 | 1001 |
| Number of PDSCH DMRS CDM group(s) without data |  | 1 | 1 |
| PDSCH & PDSCH DMRS Precoding configuration |  | Single Panel Type I, Randomized precoder selection for every PRB bundle and updated per slot, with equal probability of each applicable i1/i2 combination or codebookIndex, chosen from section 5.2.2.2.1 of TS 38.214 [12]. | Single Panel Type I, Randomized precoder selection for every PRB bundle and updated per slot, with equal probability of each applicable i1/i2 combination or codebookIndex, chosen from section 5.2.2.2.1 of TS 38.214 [12].Any column of precoder matrix is not equal to any column of precoder matrix of Target UE for test 1-1.Select the precoder to ensure any column of precoder is orthogonal to any column of precoder for the target PDSCH for test 2-1 and 2-2. |
| MU-MIMO Beamforming Model |  | As specified in B.4.2 |
| Number of HARQ Processes |  | 8 | N/A |
| 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 | N/A |
| Note 1: The DMRS scrambling ID is same for both target UE and Co-scheduled UE. |

Table 5.2.2.2.17-3: Minimum performance for target UE with 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 |
| Target UE | Co-scheduled UE | Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.7-1.1 TDD | 40 / 30 | 16QAM, 0.48 | Random 16QAM symbols | FR1.30-1 | TDLC300-100 | 2x2, ULA Low  | 70 | 18.9 |

The parameters in Table 5.2.2.2.17-4 are configured for requirements with enhanced Receiver Type 2.

Table 5.2.2.2.17-4: Assistance Information parameters for requirements with Enhanced Receiver Type 2

|  |  |
| --- | --- |
| Parameter | Value |
| AdvancedReceiver-MU-MIMO-r18 | precodingAndResourceAllocation | True |
| pdsch-TimeDomainAllocation | True |
| mcs-Table | qam256 |
| advReceiver-MU-MIMO-DCI-1-1 | Enabled |
| Co-scheduled UE information in DCI (Table 7.3.1.2.2-12 of TS38.212[10]) | 1 for Test 2-16 for Test 2-2 |

Table 5.2.2.2.17-5: Minimum performance for target UE with Rank 1 with Enhanced Receiver Type 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Target UE | Co-scheduled UE | Fraction ofmaximumthroughput(%) | SNR (dB) |
| 2-1 | R.PDSCH.7-1.1 TDD | 40 / 30 | 16QAM, 0.48 | Random QPSK symbols | FR1.30-1 | TDLC300-100 | 2x2, ULA Medium  | 70 | 16.9 |
| 2-2 | R.PDSCH.7-1.3 TDD | 40 / 30 | 64QAM,0.43 | Random 16QAM symbols | FR1.30-1 | TDLC300-100 | 2x2, ULA Medium | 70 | 26.0 |

**END OF CHANGE 1**

**START OF CHANGE 2**

##### 5.2.3.2.17 Minimum requirements for PDSCH with intra-cell inter-user interference

The performance requirements are specified in Table 5.2.3.2.17-3 and and Table 5.2.3.2.17-4, with the addition of test parameters in Table 5.2.3.2.17-2 and the downlink physical channel setup according to Annex C.3.1.

The performance requirements for UE supporting Enhanced Receiver Type 2 are specified in Table 5.2.3.2.17-6 and Table 5.2.3.2.17-7, with the addition of test parameters in Tables 5.2.3.2.17-2, 5.2.3.2.17-5 and the downlink physical channel setup according to Annex C.3.1.

The test purposes are specified in Table 5.2.3.2.17-1.

Table 5.2.3.2.17-1: Tests purpose

|  |  |
| --- | --- |
| Purpose | Test index |
| Verify PDSCH performance under 4 receive antenna conditions, when the PDSCH transmission of target UE is interfered by co-scheduled UE.  | 1-1, 2-1 |
| Verify PDSCH performance under 4 receive antenna conditions, when the PDSCH transmission of target UE is interfered by co-scheduled UE with Enhanced Receiver Type 2 when modulation order for co-scheduled UE is explicitly signaled by DCI. | 3-1, 4-1 |
| Verify PDSCH performance under 4 receive antenna conditions, when the PDSCH transmission of target UE is interfered by co-scheduled UE with Enhanced Receiver Type 2 when modulation order for co-scheduled UE is detected. | 3-2, 4-2 |

Table 5.2.3.2.17-2: Test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Target UE | Co-scheduled UE |
| 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 (Note 1) | DMRS Type |  | Type 1 |
| Number of additional DMRS |  | 1 |
| Maximum number of OFDM symbols for DL front loaded DMRS |  | 1 |
| Antenna ports indexes |  | {1000}for tests 1-1, 3-1, 3-2{1000, 1001}for tests 2-1, 4-1, 4-2 | {1001}for tests 1-1, 3-1, 3-2{1002, 1003}for tests 2-1, 4-1, 4-2 |
| Number of PDSCH DMRS CDM group(s) without data |  | 1 for tests 1-1, 3-1, 3-22 for tests 2-1, 4-1, 4-2 | 1 for tests 1-1, 3-1, 3-22 for tests 2-1, 4-1, 4-2 |
| PDSCH & PDSCH DMRS Precoding configuration |  | Single Panel Type I, Randomized precoder selection for every PRB bundle and updated per slot, with equal probability of each applicable i1/i2 combination or codebookIndex, chosen from section 5.2.2.2.1 of TS 38.214 [12]. | Single Panel Type I, Randomized precoder selection for every PRB bundle and updated per slot, with equal probability of each applicable i1/i2 combination or codebookIndex, chosen from section 5.2.2.2.1 of TS 38.214 [12]. Any column of precoder matrix is not equal to any column of precoder matrix of Target UE for test 1-1Select the precoder to ensure any column of precoder is orthogonal to any column of precoder for the target PDSCH for test 2-1, 3-1, 3-2, 4-1, 4-2 |
| MU-MIMO Beamforming Model |  | As specified in B.4.2 |
| Number of HARQ Processes |  | 8 | N/A |
| 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 | N/A |
| Note 1: DMRS scrambling ID is the same for both target and co-shceduled UEs. |

Table5.2.3.1.17-3: Minimum performance for target UE with 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 |
| Target UE | Co-scheduled UE | Fraction ofmaximumthroughput(%) | SNR (dB) |
| 1-1 | R.PDSCH.7-1.1 TDD | 40 / 30 | 16QAM, 0.48 | Random 16QAM symbols | FR1.30-1 | TDLC300-100 | 2x4, ULA Low  | 70 | 11.8 |

Table 5.2.3.2.17-4: Minimum performance for target UE with Rank 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Target UE | Co-scheduled UE | Fraction ofmaximumthroughput(%) | SNR (dB) |
| 2-1 | R.PDSCH.7-1.2 TDD | 40 / 30 | 16QAM, 0.48 | Random 16QAM symbols | FR1.30-1 | TDLA30-10 | 4x4, ULA Low  | 70 | 15.5 |

The parameters in Table 5.2.3.2.17-5 are configured for requirements with Enhanced Receiver Type 2.

Table 5.2.3.2.17-5: Assistance Information parameters for requirements with Enhanced Receiver Type 2

|  |  |
| --- | --- |
| Parameter | Value |
| AdvancedReceiver-MU-MIMO-r18 | precodingAndResourceAllocation | True |
| pdsch-TimeDomainAllocation | True |
| mcs-Table | qam256 |
| advReceiver-MU-MIMO-DCI-1-1 | Enabled |
| Co-scheduled UE information in DCI (Table 7.3.1.2.2-12 of TS38.212) | 1 for Test 3-12 for Test 4-16 for Test 3-2, 4-2 |

Table 5.2.3.2.17-6: Minimum performance for target UE with Rank 1 with Enhanced Receiver Type 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Target UE | Co-scheduled UE | Fraction ofmaximumthroughput(%) | SNR (dB) |
| 3-1 | R.PDSCH.7-1.1 TDD | 40 / 30 | 16QAM, 0.48 | Random QPSK symbols | FR1.30-1 | TDLC300-100 | 2x4, ULA Medium  | 70 | 16.0 |
| 3-2 | R.PDSCH.7-1.3 TDD | 40 / 30 | 64QAM, 0.43 | Random16-QAM symbols | FR1.30-1 | TDLC300-100 | 2x4, ULA Medium | 70 | 25.5 |

Table 5.2.3.2.17-7: Minimum performance for target UE with Rank 2 with Enhanced Receiver Type 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Target UE | Co-scheduled UE | Fraction ofmaximumthroughput(%) | SNR (dB) |
| 4-1 | R.PDSCH.7-1.4 TDD | 40 / 30 | 64QAM, 0.43 | Random 16QAM symbols | FR1.30-1 | TDLA30-10  | 4x4, ULA Low  | 70 | 19.6 |
| 4-2 | R.PDSCH.7-1.2 TDD | 40 / 30 | 16QAM, 0.48 | Random QPSK symbols | FR1.30-1 | TDLA30-10  | 4x4, ULA Low | 70 | 14.9 |

**END OF CHANGE 2**