**3GPP TSG- Meeting # *R4-2407134***

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *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:*** |  |
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| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Introduction of PDSCH CA Requirements for 8Rx. |
|  |  |
| ***Summary of change:*** | Updated tables in Clause 5.2A, introduction of 8Rx CA PDSCH Requirements |
|  |  |
| ***Consequences if not approved:*** | 8Rx PDSCH CA requirements not be included in TS 38.101-4  |
|  |  |
| ***Clauses affected:*** | 5.2, 5.2A.4 (New)  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.521-4  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revision of R4-2407134 |

***<Start of change 1>***

## 5.2A PDSCH demodulation requirements for CA

The parameters specified in Table 5.2-1 for PDSCH single carrier tests are reused for PDSCH CA tests unless otherwise stated.

Table 5.2A-1: Common test parameters for CA

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Duplex mode |  | FDD and TDD |
| Active DL BWP index |  | 1 |
| PDSCH configuration | Mapping type |  | Type A |
| k0 |  | 0 |
| Starting symbol (S)  |  | 2 |
| Length (L) |  | FDD: 12TDD: 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 |
| 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 |  | As defined in Table 5.2A-2 |
| TDD UL-DL pattern |  | 15kHz SCS: FR1.15-130kHz SCS: FR1.30-1 |
| The number of slots between PDSCH and corresponding HARQ-ACK information |  | As defined in Table 5.2A-3 |
| PUCCH format for HARQ-ACK feedback |  | PUCCH format 1 for cases where the number of ACK/NACK to be transmitted on single PUCCH is 2 or less.PUCCH format 3 for cases where the number of ACK/NACK to be transmitted on single PUCCH is more than 2. |

Table 5.2A-2: Test parameters for number of HARQ processes

|  |  |  |
| --- | --- | --- |
| HARQ process number | CCs with the same duplex mode & SCS with Pcell | CCs with different duplex mode / SCS with Pcell |
| FDD 15 kHz + TDD 30 kHz CA | FDD PCell | 4 | 8 |
| TDD PCell | For CC with Rank 2: 10For CC with Rank 8: 8 | 8 |
| FDD 15 kHz + TDD 15 kHz CA | FDD PCell | 4 | 4 |
| TDD PCell | 8 | 8 |
| TDD 15 kHz + TDD 30 kHz CA | 15kHz PCell | 8 | 12 |
| 30kHz PCell | 8 | 8 |
| FDD 15 kHz + FDD 15 kHz CA | FDD PCell | 4 | N/A |
| TDD 30 kHz + TDD 30 kHz CA | TDD PCell | 8 | N/A |

Table 5.2A-3: Test parameters for K1 values

|  |  |  |
| --- | --- | --- |
| The number of slots between PDSCH and corresponding HARQ-ACK information | CCs with the same duplex mode and SCS with Pcell | CCs with different duplex mode and/or SCS with Pcell |
| FDD 15 kHz + TDD 30 kHz CA | FDD PCell | {2} | {2} |
| TDD PCell | For CC with Rank 2: {8,7,6,5,5,4,3,11}For CC with Rank 8: {8,7,6,5,5,4,3} | {7,5,4,11,9} |
| FDD 15 kHz + TDD 15 kHz CA | FDD PCell | {2} | {2} |
| TDD PCell | {4,3,2,6} | {4,3,2,6,5} |
| TDD 15 kHz + TDD 30 kHz CA | 15kHz PCell | {4,3,2,6} | {4,4,3,3,2,2,6,6} |
| 30kHz PCell | {8,7,6,5,5,4,3,2} | {7,5,4,11} |
| FDD 15 kHz + FDD 15 kHz CA | FDD PCell | {2} | N/A |
| TDD 30 kHz + TDD 30 kHz CA | TDD PCell | For CC with Rank 2: {8,7,6,5,5,4,3,2}For CC with Rank 8: {8,7,6,5,5,4,3} | N/A |

***<End of change 1>***

***<Start of change 2>***

### 5.2A.4 8RX requirements

#### 5.2A.4.1 Minimum requirements

For CA with different numbers of DL component carriers, the requirements are defined in Table 5.2A.4.1-7 or Table 5.2A.4.1-8 (dependent on Baseline or Simplified SU-MIMO 8Rx Receiver), the requirements are based on the single carrier requirements for different SCSs and different bandwidth specified in Table 5.2A.4.1-1 ~ Table 5.2A.4.1-6, with the parameters in Table 5.2A-1 ~ Table 5.2A-3 and the downlink physical channel setup according to Annex C.3.1. The performance requirements specified in this sub-clause do not apply for UE single carrier test.

Table 5.2A.4.1-1: Single carrier performance for FDD 15 kHz SCS for CA configurations, Rank 2, Baseline SU-MIMO 8Rx Receiver

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bandwidth (MHz)  | Reference channel | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value |
| Fraction of maximum throughput (%) | SNR (dB) |
| 5 | [R.PDSCH.1-22.1 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.5] |
| 10 | R.PDSCH.1-2.2 FDD | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.6] |
| 15 | [R.PDSCH.1-22.2 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |
| 20 | [R.PDSCH.1-22.3 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |
| 25 | [R.PDSCH.1-22.4 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |
| 30 | [R.PDSCH.1-23.1 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.8] |
| 35 | [R.PDSCH.1-23.2 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.8] |
| 40 | [R.PDSCH.1-23.3 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.8] |
| 45 | [R.PDSCH.1-23.4 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.9] |
| 50 | [R.PDSCH.1-23.5 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [14.0] |

Table 5.2A.4.1-2: Single carrier performance for FDD 15 kHz SCS for CA configurations, Rank 2, Simplified SU-MIMO 8Rx Receiver

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bandwidth (MHz)  | Reference channel | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value |
| Fraction of maximum throughput (%) | SNR (dB) |
| 5 | [R.PDSCH.1-22.1 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [15.9] |
| 10 | R.PDSCH.1-2.2 FDD | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.0] |
| 15 | [R.PDSCH.1-22.2 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.0] |
| 20 | [R.PDSCH.1-22.3 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 25 | [R.PDSCH.1-22.4 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 30 | [R.PDSCH.1-23.1 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.2] |
| 35 | [R.PDSCH.1-23.2 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 40 | [R.PDSCH.1-23.3 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.2] |
| 45 | [R.PDSCH.1-23.4 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.3] |
| 50 | [R.PDSCH.1-23.5 FDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.4] |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 5.2A.4.1-3: Single carrier performance for FDD 15 kHz SCS for CA configurations, Rank 8Bandwidth (MHz)  | Reference channel | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value |
| Fraction of maximum throughput (%) | SNR (dB) |
| 5 | [R.PDSCH.1-20.1 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.6] |
| 10 | R.PDSCH.1-3.7 FDD | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.7] |
| 15 | [R.PDSCH.1-20.2 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.1] |
| 20 | [R.PDSCH.1-20.3 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.4] |
| 25 | [R.PDSCH.1-20.4 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.4] |
| 30 | [R.PDSCH.1-23.1 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.6] |
| 35 | [R.PDSCH.1-23.2 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.8] |
| 40 | [R.PDSCH.1-23.3 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [24.1] |
| 45 | [R.PDSCH.1-23.4 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [24.0] |
| 50 | [R.PDSCH.1-23.5 FDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [24.0] |

Table 5.2A.4.1-4: Single carrier performance for TDD 30 kHz SCS for CA configurations, Rank 2, Baseline SU-MIMO 8Rx Receiver

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bandwidth (MHz)  | Reference channel | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value |
| Fraction of maximum throughput (%) | SNR (dB) |
| 5 | [R.PDSCH.2-36.1 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.3] |
| 10 | [R.PDSCH.2-36.2 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.5] |
| 15 | [R.PDSCH.2-36.3 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.6] |
| 20 | [R.PDSCH.2-36.4 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.6] |
| 25 | [R.PDSCH.2-36.5 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.6] |
| 30 | [R.PDSCH.2-36.6 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.6] |
| 40 | R.PDSCH.2-3.1 TDD | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |
| 50 | [R.PDSCH.2-37.1 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |
| 60 | [R.PDSCH.2-37.2 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.8] |
| 80 | [R.PDSCH.2-37.3 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [14.0] |
| 90 | [R.PDSCH.2-37.4 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |
| 100 | [R.PDSCH.2- 37.5 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [13.7] |

Table 5.2A.4.1-5: Single carrier performance for TDD 30 kHz SCS for CA configurations, Rank 2, Simplified SU-MIMO 8Rx Receiver

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bandwidth (MHz)  | Reference channel | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value |
| Fraction of maximum throughput (%) | SNR (dB) |
| 5 | [R.PDSCH.2-36.1 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [15.9] |
| 10 | [R.PDSCH.2-36.2 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [15.9] |
| 15 | [R.PDSCH.2-36.3 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.0] |
| 20 | [R.PDSCH.2-36.4 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.0] |
| 25 | [R.PDSCH.2-36.5 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 30 | [R.PDSCH.2-36.6 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 40 | R.PDSCH.2-3.1 TDD | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.0] |
| 50 | [R.PDSCH.2-37.1 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 60 | [R.PDSCH.2-37.2 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.1] |
| 80 | [R.PDSCH.2-37.3 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.3] |
| 90 | [R.PDSCH.2-37.4 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.4] |
| 100 | [R.PDSCH.2- 37.5 TDD] | 64QAM, 0.5 | TDLC300-100 | 2x8, ULA Medium B | 70 | [16.3] |

Table 5.2A.4.1-6: Single carrier performance for TDD 30 kHz SCS for CA configurations, Rank 8

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bandwidth (MHz)  | Reference channel | Modulation format and code rate | Propagation condition | Correlation matrix and antenna configuration | Reference value |
| Fraction of maximum throughput (%) | SNR (dB) |
| 5 | [R.PDSCH.2-34.1 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.7] |
| 10 | [R.PDSCH.2-34.2 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.6] |
| 15 | [R.PDSCH.2-34.3 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.9] |
| 20 | [R.PDSCH.2-34.4 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.8] |
| 25 | [R.PDSCH.2-34.5 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [22.8] |
| 30 | [R.PDSCH.2-34.6 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.2] |
| 40 | R.PDSCH.2-3.7 TDD | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.1] |
| 50 | [R.PDSCH.2-35.1 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.2] |
| 60 | [R.PDSCH.2-35.2 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.6] |
| 80 | [R.PDSCH.2-35.3 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.8] |
| 90 | [R.PDSCH.2-35.4 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [23.9] |
| 100 | [R.PDSCH.2- 35.5 TDD] | 64QAM, 0.43 | TDLA30-10 | 8x8, ULA Low | 70 | [24.0] |

Table 5.2A.4.1-7: Minimum performance for multiple CA configurations, Baseline Receiver

|  |  |  |
| --- | --- | --- |
| Test number | CA duplex mode | Minimum performance requirements |
| 1 | FDD 15 kHz + FDD 15 kHz | As defined in Tables 5.2A.4.1-1, and 5.2A.4.1-3 per CC |
| 2 | TDD 30 kHz + TDD 30 kHz | As defined in Tables 5.2A.4.1-4, and 5.2A.4.1-6 per CC |
| 3 | FDD 15 kHz + TDD 30 kHz | As defined in Tables 5.2A.4.1-1, 5.2A.4.1-3, 5.2A.4.1-4, and 5.2A.4.1-6 per CC |
| Note 1: The applicability of requirements for different CA duplex modes, SCSs, CA configurations and bandwidth combination sets is defined in 5.1.1.7.Note 2: For CA combinations between 8Rx and 4Rx or 2Rx, Rank 2 requirements in Tables 5.2A.4.1-1 and 5.2A.4.1-4 shall be applied for both CCs.Note 3: For CA Combinations with two 8Rx CCs, Rank 8 requirements in Tables 5.2A.4.1-3 and 5.2A.4.1-6 shall be applied for both CCs. |

Table 5.2A.4.1-8: Minimum performance for multiple CA configurations, Simplified Receiver

|  |  |  |
| --- | --- | --- |
| Test number | CA duplex mode | Minimum performance requirements |
| 1 | FDD 15 kHz + FDD 15 kHz | As defined in Tables 5.2A.4.1-2, and 5.2A.4.1-3 per CC |
| 2 | TDD 30 kHz + TDD 30 kHz | As defined in Tables 5.2A.4.1-5, and 5.2A.4.1-6 per CC |
| 3 | FDD 15 kHz + TDD 30 kHz | As defined in Tables 5.2A.4.1-2, 5.2A.4.1-3, 5.2A.4.1-5, and 5.2A.4.1-6 per CC |
| Note 1: The applicability of requirements for different CA duplex modes, SCSs, CA configurations and bandwidth combination sets is defined in 5.1.1.7.Note 2: For CA combinations between 8Rx and 4Rx or 2Rx, Rank 2 requirements in Tables 5.2A.4.1-2 and 5.2A.4.1-5 shall be applied for both CCs.Note 3: For CA Combinations with two 8Rx CCs, Rank 8 requirements in Tables 5.2A.4.1-3 and 5.2A.4.1-6 shall be applied for both CCs. |

***<End of change 2>***