**3GPP TSG-RAN WG4 Meeting #100-e *R4-2115743***

**E-meeting, 16th August – 27th August 2021**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **37.901-5** | **CR** | **-** | **rev** | **-** | **Current version:** | **16.4.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](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:*** | Intel Corporation | | | | | | | | | |
| ***Source to TSG:*** | RAN4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_UE\_5GNR\_App\_Data\_Perf | | | | |  | ***Date:*** | | | 2021-08-06 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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:*** | | Inroduction of section with summaries of simulation results from different companies. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Added sections for colletion of Absolute Physical Layer Throughput, CSI statistics and BLER results | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Section with simuation results is missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Section structure is based on endorsed Draft CR R4-2111255. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**START OF CHANGE**

5.10.4 Simulation Results

In this section link level simulation results from different companies are collected. The following metrics are analysed:

* Absolute Physical Layer Throughput
* CQI and RI statistics (median of reported values)
* BLER

The simulation results are prepared based on simulation assumptions from Section 5.10.3.

The detailed simulation results from different companies are provided in the attached excel file:



5.10.4.1 Absolute Physical Layer Throughput

Table 5.10.4.1-1 provides the information about throughput span of simulations results from different companies. The span of simulation results is calculated using the following equation:

**Table 5.10.4.1-1: Throughput span of simulation results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **FR1 FDD** | | | | **FR1 TDD** | | | | **FR2** | |
|  | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | |
| **SNR** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** |
| **0** | 3.6 | 39% | 5.4 | 48% | 10.6 | 25% | 18.6 | 30% | 19.6 | 28% |
| **2** | 5.1 | 36% | 7.5 | 26% | 15.1 | 10% | 24.5 | 25% | 25.9 | 27% |
| **4** | 7.0 | 36% | 9.2 | 39% | 20.9 | 12% | 30.2 | 28% | 34.5 | 28% |
| **6** | 8.9 | 33% | 12.4 | 34% | 26.9 | 14% | 40.9 | 27% | 44.4 | 26% |
| **8** | 10.9 | 31% | 15.9 | 19% | 33.4 | 14% | 52.8 | 23% | 53.9 | 26% |
| **10** | 13.1 | 27% | 20.1 | 13% | 40.3 | 13% | 65.4 | 15% | 63.5 | 25% |
| **12** | 15.5 | 24% | 24.1 | 10% | 47.4 | 12% | 78.1 | 9% | 75.2 | 20% |
| **14** | 17.9 | 22% | 28.0 | 10% | 54.5 | 13% | 91.1 | 10% | 87.4 | 17% |
| **16** | 20.5 | 19% | 32.3 | 7% | 62.8 | 14% | 104.3 | 9% | 100.1 | 13% |
| **18** | 23.3 | 17% | 36.7 | 9% | 72.6 | 15% | 116.1 | 9% |  |  |
| **20** | 26.4 | 19% | 40.7 | 13% | 82.6 | 13% | 127.8 | 11% |  |  |

Table 5.10.4.1-2 provides the information about the SNR span of simulations results from different companies. The SNR span is measured on different percentage level on maximum achievable throughput. The maximum achievable throughput is calculated under assumption of Rank 2 transmission and MCS corresponding to the highest CQI (i.e. 15).

**Table 5.10.4.1-1: SNR span of simulation results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **FR1 FDD** | | | | **FR1 TDD** | | | | **FR2** | |
|  | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | |
| **% of Max T-put** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** |
| **10** | 3.5 | 2.3 | 1.3 | 1.2 | 4.0 | 0.8 | 1.1 | 1.8 | 1.6 | 1.8 |
| **15** | 6.8 | 3.0 | 4.3 | 2.7 | 7.3 | 1.4 | 4.1 | 2.2 | 4.4 | 2.1 |
| **20** | 9.8 | 3.2 | 6.3 | 2.0 | 10.4 | 1.5 | 6.1 | 2.0 | 7.0 | 2.7 |
| **25** | 12.6 | 3.6 | 8.0 | 1.5 | 13.3 | 1.9 | 7.8 | 1.8 | 9.5 | 2.8 |
| **30** | 15.1 | 3.3 | 9.6 | 1.2 | 15.9 | 1.9 | 9.5 | 1.5 | 11.6 | 2.6 |
| **35** | 17.5 | 2.7 | 11.3 | 1.2 | 18.0 | 1.9 | 11.1 | 1.1 | 13.6 | 2.4 |
| **40** | 19.4 | 2.7 | 12.9 | 1.5 | 20.0 | 2.0 | 12.8 | 1.2 | 15.4 | 2.0 |
| **45** |  |  | 14.5 | 1.3 |  |  | 14.4 | 1.4 |  |  |
| **50** |  |  | 16.0 | 0.9 |  |  | 16.0 | 1.5 |  |  |
| **55** |  |  | 17.5 | 1.7 |  |  | 17.7 | 1.7 |  |  |
| **60** |  |  | 18.8 | 1.1 |  |  | 19.0 | 1.3 |  |  |

5.10.4.2 RI statistics

Table 5.10.4.2-1 provides the information about the Median CQI span of simulations results from different companies.

**Table 5.10.4.2-1: Median RI span of simulation results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **FR1 FDD** | | | | **FR1 TDD** | | | | **FR2** | |
|  | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | |
| **SNR** | **Median** | **Span** | **Median** | **Span** | **Median** | **Span** | **Median** | **Span** | **Median** | **Span** |
| **0** | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| **2** | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| **4** | 1 | 0 | 2 | 1 | 1 | 0 | 2 | 1 | 1 | 0 |
| **6** | 1 | 0 | 2 | 1 | 1 | 0 | 2 | 1 | 1 | 0 |
| **8** | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 1 | 0 |
| **10** | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 1 | 0 |
| **12** | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 1 | 1 |
| **14** | 1 | 1 | 2 | 0 | 1 | 1 | 2 | 0 | 2 | 1 |
| **16** | 2 | 1 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 1 |
| **18** | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 |  |  |
| **20** | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 |  |  |

5.10.4.3 CQI statistics

Table 5.10.4.3-1 provides the information about the Median CQI span of simulations results from different companies. Median CQI value for each SNR point is calculated based on CQI values corresponding to median RI for the considered SNR point.

**Table 5.10.4.3-1: Median CQI span of simulation results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **FR1 FDD** | | | | **FR1 TDD** | | | | **FR2** | |
|  | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | |
| **SNR** | **Median** | **Span** | **Median** | **Span** | **Median** | **Span** | **Median** | **Span** | **Median** | **Span** |
| **0** | 3 | 1 | 4 | 2 | 3 | 1 | 4 | 2 | 5 | 0 |
| **2** | 4 | 1 | 5 | 3 | 4 | 1 | 5 | 3 | 6 | 1 |
| **4** | 5 | 1 | 4 | 3 | 5 | 1 | 4 | 4 | 7 | 1 |
| **6** | 6 | 1 | 5 | 3 | 6 | 1 | 5 | 4 | 9 | 1 |
| **8** | 6 | 1 | 6 | 2 | 7 | 1 | 5 | 2 | 9 | 1 |
| **10** | 8 | 1 | 6 | 1 | 8 | 1 | 6 | 0 | 11 | 1 |
| **12** | 8 | 2 | 8 | 1 | 9 | 2 | 7 | 1 | 11 | 4 |
| **14** | 9 | 4 | 8 | 1 | 9 | 4 | 8 | 1 | 9 | 4 |
| **16** | 7 | 5 | 9 | 1 | 7 | 2 | 9 | 2 | 9 | 4 |
| **18** | 8 | 5 | 10 | 1 | 8 | 2 | 10 | 1 |  |  |
| **20** | 9 | 1 | 11 | 1 | 8 | 2 | 11 | 0 |  |  |

5.10.4.4 BLER

Table 5.10.4.4-1 provides the information about the BLER span of simulations results from different companies.

**Table 5.10.4.4-1: BLER span of simulation results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **FR1 FDD** | | | | **FR1 TDD** | | | | **FR2** | |
|  | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | | **4 Rx UE** | | **2 Rx UE** | |
| **SNR** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** | **Avg** | **Span** |
| **0** | 0.16 | 0.20 | 0.21 | 0.43 | 0.15 | 0.25 | 0.16 | 0.28 | 0.13 | 0.21 |
| **2** | 0.13 | 0.17 | 0.15 | 0.22 | 0.13 | 0.26 | 0.13 | 0.27 | 0.11 | 0.24 |
| **4** | 0.11 | 0.13 | 0.18 | 0.32 | 0.14 | 0.21 | 0.13 | 0.25 | 0.09 | 0.24 |
| **6** | 0.11 | 0.14 | 0.15 | 0.28 | 0.13 | 0.19 | 0.11 | 0.16 | 0.08 | 0.16 |
| **8** | 0.10 | 0.13 | 0.10 | 0.23 | 0.11 | 0.15 | 0.07 | 0.13 | 0.08 | 0.16 |
| **10** | 0.10 | 0.11 | 0.07 | 0.13 | 0.10 | 0.17 | 0.04 | 0.07 | 0.09 | 0.26 |
| **12** | 0.10 | 0.10 | 0.07 | 0.14 | 0.09 | 0.19 | 0.04 | 0.09 | 0.09 | 0.26 |
| **14** | 0.11 | 0.12 | 0.07 | 0.18 | 0.10 | 0.20 | 0.04 | 0.11 | 0.09 | 0.29 |
| **16** | 0.11 | 0.15 | 0.08 | 0.17 | 0.10 | 0.19 | 0.05 | 0.14 | 0.09 | 0.29 |
| **18** | 0.12 | 0.18 | 0.08 | 0.13 | 0.09 | 0.22 | 0.08 | 0.12 |  |  |
| **20** | 0.14 | 0.18 | 0.09 | 0.17 | 0.10 | 0.24 | 0.09 | 0.14 |  |  |

**END OF CHANGE**