**3GPP TSG-RAN WG2 Meeting #111 electronic R2-201**

**Online, November 2nd - 13th, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.314** | **CR** | **0011** | **rev** | **1** | **Current version:** | **16.1.0** |  |
|  | | | | | | | | |
| *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 | **x** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Introduction of PRB Usage for Massive MIMO | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CMCC | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_SON\_MDT-Core | | | | |  | ***Date:*** | | | 2020-11-13 |
|  |  | | | |  | |  | | |  |
| ***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 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-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | There are mainly two motivations for PRB Usage. First motivation is to help operators or network vendors to decide whether the capacity of the cell needs to be expanded. Second motivation is for inter-cell load balancing.  PRB Usage has been defined in TS 28.552 in Rel-16. However, the main drawback for the current definition for PRB Usage is that they didn’t take MIMO layer and MU-MIMO into consideration. Without considering the MIMO, it may happen that the calculated PRB Usage is larger than the actual value.  So, new measurements for PRB Usage are required to be introduced in TS 38.314 to reflect multiple MIMO layers and MU-MIMO. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Rev0:   * new measurements for PRB Usage are introduced in TS 38.314 to reflect multiple MIMO layers and MU-MIMO. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The existing measurement PRB Usage doesn’t reflect multiple MIMO layers and MU-MIMO. If multiple MIMO layers and MU-MIMO are configured, it may happen that the calculated PRB Usage is larger than the actual value. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.2.1x (New) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## << Start of changes >>

4 Layer 2 measurements

4.2.1 Measurements valid for all gNB deployment scenarios

## << Partially omitted >>

4.2.1.6 Other measurements defined in TS 28.552

The granularity for PDCP SDU Data Volume measurement defined in TS 28.552 [2] is per DRB per UE.

The granularity for Average UE throughout measurement defined in TS 28.552 [2] is per UE and per DRB per UE.

PRB usage measurements are defined in TS 28.552 [2], i.e. DL/UL Total PRB Usage, Distribution of DL/UL Total PRB Usage. M(T), M1(T), P(T) are measured per cell. P(T) is the total available PRBs for this cell. M1(T) is the PRBs used for traffic transmission in this cell. Counting unit for PRB usage measurement is 1 Resource Block x 1 symbol. (1 Resource Block = 12 sub-carrier)

4.2.1.x PRB Usage

4.2.1.x.1 PDSCH PRB Usage for Massive MIMO in the DL per cell

This measurement provides the total usage (in percentage) of PDSCH physical resource blocks (PRBs) for Massive MIMO in the downlink per cell. The objective of the measurement is to measure usage of time and frequency resources. A use case is cell load balancing, where PRB usage is used for information signalled across the Xn interface. Another use-case is OAM performance observability.

Protocol Layer: MAC, PHY

**Table 4.2.1.x.1-1: Definition for PDSCH PRB Usage for Massive MIMO in the DL per cell**

|  |  |
| --- | --- |
| Definition | PDSCH PRB Usage for Massive MIMO in the DL per cell is calculated in the time-frequency domain.  Detailed Definition:  where  explanations can be found in the table 4.2.1.x.1-2 below. |

**Table 4.2.1.x.1-2: Parameter description for PDSCH PRB Usage for Massive MIMO in the DL per cell**

|  |  |
| --- | --- |
|  | Total PDSCH PRB usage per cell. Percentage of PRBs used, averaged during time period . Integer value range: 0-100 |
|  | PDSCH PRBs used for traffic transmission for UE on single MIMO layer in this cell during time period *T*.  Counting unit for PRB is 1 Resource Block x 1 symbol. (1 Resource Block = 12 sub-carrier) |
|  | The number of MIMO layers scheduled for UE during time period *T*. |
|  | A UE that is scheduled during time period 𝑇. |
|  | Total number of PDSCH PRBs available during time period 𝑇 on single MIMO layer in this cell. |
|  | Time Period during which the measurement is performed. |
|  | Constant value configured by OAM. With this parameter, should not be larger than 100%. |

4.2.1.x.2 PUSCH PRB Usage for Massive MIMO in the UL per cell

This measurement provides the total usage (in percentage) of PUSCH physical resource blocks (PRBs) for Massive MIMO in the uplink per cell. The objective of the measurement is to measure usage of time and frequency resources. A use case is cell load balancing, where PRB usage is used for information signalled across the Xn interface. Another use-case is OAM performance observability.

Protocol Layer: MAC, PHY

**Table 4.2.1.x.2-1: Definition for PUSCH PRB Usage for Massive MIMO in the UL per cell**

|  |  |
| --- | --- |
| Definition | PUSCH PRB Usage for Massive MIMO in the UL per cell is calculated in the time-frequency domain.  Detailed Definition:  where  explanations can be found in the table 4.2.1.x.1-2 below. |

**Table 4.2.1.x.1-2: Parameter description for PUSCH PRB Usage for Massive MIMO in the UL per cell**

|  |  |
| --- | --- |
|  | Total PUSCH PRB usage per cell. Percentage of PRBs used, averaged during time period . Integer value range: 0-100 |
|  | PUSCH PRBs scheduled for traffic transmission for UE on single MIMO layer in this cell during time period *T*.  Counting unit for PRB is 1 Resource Block x 1 symbol. (1 Resource Block = 12 sub-carrier) |
|  | The number of MIMO layers scheduled for UE during time period *T*. |
|  | A UE that is scheduled during time period 𝑇. |
|  | Total number of PUSCH PRBs available during time period 𝑇 on single MIMO layer in this cell. |
|  | Time Period during which the measurement is performed. |
|  | Constant value configured by OAM. With this parameter, should not be larger than 100%. |

<< End of change >>