**3GPP TSG-SA5 Meeting #138-e *S5-214165***

**e-meeting, 23 - 31 August 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **28.552** | **CR** | **0314** | **rev** | - | **Current version:** | **17.3.1** |  |
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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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Add PRB Usage for MIMO scenario | | | | | | | | | |
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| ***Source to WG:*** | China Unicom, Huawei, CATT | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | ePM\_KPI\_5G | | | | |  | ***Date:*** | | | 2021-08-10 |
|  |  | | | |  | |  | | |  |
| ***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)* | |
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| ***Reason for change:*** | | The PRB usage for MIMO (which is already defined in TS 38.314) is not defined in TS 28.552; | | | | | | | | |
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| ***Summary of change:*** | | Introduce the PRB usage for MIMO in TS 28.552，which takes into account the resource occupancy in both frequency domain and space domain, and the spatial layer resources are considered in the numerator and denominator. | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
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| ***Clauses affected:*** | | 5.1.1.2.x(new), 5.1.1.2.y(new) | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st Change** |

##### 5.1.1.2.x PDSCH PRB Usage for MIMO

a) This measurement provides the total usage (in percentage) of physical resource blocks (PRBs) for MIMO in the downlink.

b) SI

c) This measurement is obtained as:

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where denotes total PDSCH PRB usage per cell which is percentage of PRBs used, averaged during time period 𝑇 with integer value range: 0-100; denotes a count of PDSCH PRBs used for traffic transmission for UE 𝑖 on single MIMO layer per cell at sampling occasion 𝑗; denotes the number of MIMO layers scheduled for UE 𝑖 at sampling occasion 𝑗; *N(T)* denotes total number of sampling occasions taken during time period T; *P(T)* denotes total number of PDSCH PRBs available for 1 sampling occasion on single MIMO layer per cell;*Alpha* is a constant value configured by OAM with integer value range: 1-100. With this parameter, M(T) should not be larger than 100; *T* denotes the time period during which measurement is performed; *i* denotes a UE that is scheduled during time period T; and *j* denotes sampling occasion during time period T, a sampling occasion is 1 symbol.

d) A single integer value from 0 to 100.

e) RRU.PrbTotDlMimo, *which indicates the PDSCH PRB Usage for MIMO*

f) NRCellDU

g) Valid for packet switched traffic

h) 5GS

i) One usage of this measurement is for monitoring the load of the radio physical layer under MIMO scenario.

##### 5.1.1.2.y PUSCH PRB Usage for MIMO

a) This measurement provides the total usage (in percentage) of physical resource blocks (PRBs) for MIMO in the uplink.

b) SI

c) This measurement is obtained as:

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where denotes total PUSCH PRB usage per cell which is percentage of PRBs used, averaged during time period 𝑇 with integer value range: 0-100; denotes a count of PUSCH PRBs used for traffic transmission for UE 𝑖 on single MIMO layer per cell at sampling occasion 𝑗; denotes the number of MIMO layers scheduled for UE 𝑖 at sampling occasion 𝑗; *N(T)* denotes total number of sampling occasions taken during time period T; *P(T)* denotes total number of PUSCH PRBs available for 1 sampling occasion on single MIMO layer per cell; *Alpha* is a constant value configured by OAM with integer value range: 1-100. With this parameter, M(T) should not be larger than 100; *T* denotes the time period during which measurement is performed; *i* denotes a UE that is scheduled during time period T; and *j* denotes sampling occasion during time period T, a sampling occasion is 1 symbol.

d) A single integer value from 0 to 100.

e) RRU.PrbTotUlMimo, *which indicates the PUSCH PRB Usage for MIMO*

f) NRCellDU

g) Valid for packet switched traffic

h) 5GS

i) One usage of this measurement is for monitoring the load of the radio physical layer under MIMO scenario.

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| **2nd Change** |

# A.X Monitoring of PRB Usage for MIMO in NG-RAN

The PRB Usage for MIMO measurement could provide operators the load information of radio network in MIMO scenario taking spatial resource into consideration. The measurements can help operators be aware of whether a cell has experienced high load.

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| **End of Change** |