**3GPP TSG-SA5 Meeting #129e *S5-201333rev2***

**e-meeting, 24 February – 4 March 2020**

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| *CR-Form-v11.4* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **28.552** | **CR** | 0196 | **rev** | **1** | **Current version:** | **16.4.0** |  |
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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:*** | Modify PRB usage measurements | | | | | | | | | |
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| ***Source to WG:*** | ZTE, China Telecom | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_SLICE\_ePA | | | | |  | ***Date:*** | | | 2020/2/10 |
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| ***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)* | |
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| ***Reason for change:*** | | NR can dynamically share with LTE in same spectrum bandwidth in TTI (the millisecond resolution). PRB usage needs to be measured on TTI precision.  The subcounter for dynamic spectrum sharing scenarios needs be added.  When NR UE is connecting to NR Cell using initial BWP (only 48 PRBs), if the PRB usage is too high because of a lot of UEs access in the NR cell, the delay of UE accessing to the network will be increased. So the initial BWP PRB usage needs be added. | | | | | | | | |
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| ***Summary of change:*** | | Update the measure precision of the PRB usage distribution and add sub counters for dynamic spectrum sharing and initial BWP PRB usage. | | | | | | | | |
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| ***Consequences if not approved:*** | | The Distribution of DL/UL Total PRB Usage is not accuracy.  The monitoring of congestion condition caused by PRB resource may be missed.  The PRB usage in dynamic spectrum sharing scenario is missing.  The monitoring of congestion condition caused by initial BWP PRB resource may be missed. | | | | | | | | |
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| ***Clauses affected:*** | | 2, 5.1.1.2.3, 5.1.1.2.4,5.1.1.2.X(new), A.6 | | | | | | | | |
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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)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | |  | | | | | | | | |

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| **1st modified section** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".

[3] 3GPP TS 32.404: "Performance Management (PM); Performance measurements - Definitions and template".

[4] 3GPP TS 23.501: "System Architecture for the 5G System".

[5] IETF RFC 5136: "Defining Network Capacity".

[6] 3GPP TS 38.473: "NG-RAN; F1 Application Protocol (F1AP)".

[7] 3GPP TS 23.502: "Procedures for the 5G System".

[8] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[9] 3GPP TS 32.425: "Performance Management (PM); Performance measurements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN)".

[10] 3GPP TS 32.451: "Key Performance Indicators (KPI) for Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Requirements".

[11] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[12] Void.

[13] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".[14] 3GPP TS 29.502: "5G System; Session Management Services; Stage 3".

[15] Void.

[16] 3GPP TS 29.244: "Technical Specification Group Core Network and Terminals; Interface between the Control Plane and the User Plane Nodes; Stage 3".

[17] ETSI GS NFV-IFA027 v2.4.1: "Network Functions Virtualisation (NFV); Management and Orchestration; Performance Measurements Specification".

[18] Void.

[19] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[20] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[21] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[22] 3GPP TS 29.413: "Application of the NG Application Protocol (NGAP) to non-3GPP access".

[23] 3GPP TS 29.122: "Technical Specification Group Core Network and Terminals; T8 reference point for Northbound APIs".

[24] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[25] ETSI ES 202 336-12 V1.2.1: "Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (power, cooling and building environment systems used in telecommunication networks); Part 12: ICT equipment power, energy and environmental parameters monitoring information model".

[26] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[27] 3GPP TS 29.274: "Evolved General Packet Radio Service (GPRS); Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[28] 3GPP TS 29.510: "5G System; Network function repository services; Stage 3".

[x] 3GPP TS 38.321: "NR; Radio Resource Control (RRC) protocol specification"

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| **Next modified section** |

##### 5.1.1.2.3 Distribution of DL Total PRB Usage

a) This measurement provides the distribution of samples with total usage (in percentage) of physical resource blocks (PRBs) on the downlink in different ranges. This measurement is a useful measure of whether a cell is under high loads or not in the scenario which a cell in the downlink may experience high load in certain short times (e.g. in a millisecond) and recover to normal very quickly.

b) CC

c) Each measurement sample is obtained as: , where is total PRB usage at sample n for DL, which is a percentage of PRBs used, averaged during time period tn (at most one millisecond) with value range: 0-100%; is a count of full physical resource blocks and all PRBs used for DL traffic transmission shall be included;is the total number of PRBs available for DL traffic transmission during time period tn and n is the sample with time period tn during which the measurement is performed.



d) Distribution of total PRB usage is calculated in the time-frequency domain only. The reference point is the Service Access Point between MAC and L1. The distribution of PRB usage provides the histogram result of the samples collected during time period tn.

e) Depending on the value of the sample, the proper bin of the counter is increased. The number of samples during one measurement period is provided by the operator.

f) A set of integers. Each representing the (integer) number of samples with a DL total PRB percentage usage in the range represented by that bin.

g) RRU.PrbTotDlDist.BinX, which indicates the distribution of DL PRB Usage for all traffic.

h) NRCellDU

i) Valid for packet switched traffic

j) 5GS

k) One usage of this measurement is for monitoring the load of the radio physical layer.

##### 5.1.1.2.4 Distribution of UL total PRB usage

a) This measurement provides the distribution of samples with total usage (in percentage) of physical resource blocks (PRBs) on the uplink in different usage ranges. This measurement is a useful measure of whether a cell is under high loads or not in the scenario which a cell in the uplink may experience high load in certain short times (e.g. in a millisecond) and recover to normal very quickly.

b) CC

c) Each measurement sample is obtained as: , where is total PRB usage at sample n for UL, which is a percentage of PRBs used, averaged during time period tn (at most one millisecond ) with value range: 0-100%; is a count of full physical resource blocks and all PRBs used for UL traffic transmission shall be included;is the total number of PRBs available for UL traffic transmission during time period tn and n is the sample with time period tn during which the measurement is performed.



Distribution of total PRB usage is calculated in the time-frequency domain only. The reference point is the Service Access Point between MAC and L1. The distribution of PRB usage provides the histogram result of the samples collected during time period tn.

Depending on the value of the sample, the proper bin of the counter is increased. The number of samples during one measurement period is provided by the operator.

d) A set of integers, each representing the (integer) number of samples with a UL PRB percentage usage in the range represented by that bin.

e) RRU.PrbTotUlDist.BinX, which indicates the distribution of UL PRB Usage for all traffic.

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.

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| **Next modified section** |

##### 5.1.1.2.X UL PRB used for Initial BWP

a) This measurement provides the number of physical resource blocks (PRBs) in total used in uplink initial BWP (see TS 38.321[x]).

b) CC.

c) Each measurement is obtained as the all PRBs used for UL data traffic transmission used in uplink initial BWP*.*



d) Each measurement is a single integer value.

e) RRU.PrbUsedUlInitialBWP.

f) BWP

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the UL PRB load of the radio physical layer initial BWP.

##### 5.1.1.2.Y UL total available Initial BWP PRB

a) This measurement provides the total number of physical resource blocks (PRBs) in available uplink of initial BWP (see TS 38.321[x]).

b) CC.

c) The measurement is obtained total available count of PRBs available for uplink initial BWP*.*

d) Each measurement is a single integer value.

e) RRU.PrbAvailUlInitialBWP*.*

f) BWP.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the total number of available PRBs in uplink of initial BWP .

##### 5.1.1.2.Z DL PRB used for Initial BWP

a) This measurement provides the number of physical resource blocks (PRBs) in total used in downlink initial BWP (see TS 38.321[x]).

b) CC.

c) Each measurement is obtained as the all PRBs used for DL data traffic transmission used in downlink initial BWP*.*



d) Each measurement is a single integer value.

e) RRU.PrbUsedDlInitialBWP.

f) BWP

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the DL PRB load of the radio physical layer initial BWP.

##### 5.1.1.2.A DL total available Initial BWP PRB

a) This measurement provides the total number of physical resource blocks (PRBs) in available downlink of initial BWP (see TS 38.321[x]).

b) CC.

c) The measurement is obtained total available PRBs available for downlink initial BWP*.*

d) Each measurement is a single integer value.

e) RRU.PrbAvailDlInitialBWP*.*

f) BWP.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the total number of available PRBs in downlink of initial BWP .

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| **Next modified section** |

##### 5.1.1.2.B UL PRB used by NR Dynamic Spectrum Sharing

a) This measurement provides the number of physical resource blocks (PRBs) in total used by NR cell in uplink Dynamic Spectrum Sharing from LTE Spectrum.

b) CC.

c) Each measurement is obtained as the all PRBs used for UL transmission used in uplink Dynamic Spectrum Sharing.

d) Each measurement is a single integer value.

e) RRU.PrbUsedUlDSS.

f) NRCELLDU

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the UL PRB load of the radio physical layer at Dynamic Spectrum Sharing scenario.

##### 5.1.1.2.C UL PRB used by LTE cell for Dynamic Spectrum Sharing

a) This measurement provides the number of physical resource blocks (PRBs) in total used by LTE cell in uplink Dynamic Spectrum Sharing from LTE Spectrum.

b) CC.

c) Each measurement is obtained as the all PRBs used for UL transmission used by LTE cell in uplink Dynamic Spectrum Sharing*.*

d) Each measurement is a single integer value.

e) RRU.PrbUsedUlDSS.LTE

f) NRCELLDU

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the UL PRB load of the radio physical layer at Dynamic Spectrum Sharing scenario.

##### 5.1.1.2.D UL total available NR PRB for Dynamic Spectrum Sharing

a) This measurement provides the total number of available UL physical resource blocks (PRBs) in NR cell at Dynamic Spectrum Sharing from LTE Spectrum.

b) CC.

c) The measurement is obtained total available count of PRBs available for NR cell uplink Dynamic Spectrum Sharing*.*

d) Each measurement is a single integer value.

e) RRU.PrbAvailUlDSS*.*

f) NRCELLDU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the total number of available PRBs in uplink at Dynamic Spectrum Sharing scenario.

##### 5.1.1.2.E DL PRB used by NR for Dynamic Spectrum Sharing

a) This measurement provides the number of physical resource blocks (PRBs) in total used by NR cell in downlink Dynamic Spectrum Sharing from LTE Spectrum.

b) CC.

c) Each measurement is obtained as the all PRBs used for DL data traffic transmission used by NR cell in downlink Dynamic Spectrum Sharing.



d) Each measurement is a single integer value.

e) RRU.PrbUsedDlDSS.

f) NRCELLDU

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the DL PRB load of the radio physical layer at Dynamic Spectrum Sharing scenario.

##### 5.1.1.2.F DL PRB used by LTE cell for Dynamic Spectrum Sharing

a) This measurement provides the number of physical resource blocks (PRBs) in total used by LTE cell in downlink Dynamic Spectrum Sharing from LTE Spectrum.

b) CC.

c) Each measurement is obtained as the all PRBs used for DL data traffic transmission used by LTE cell in downlink Dynamic Spectrum Sharing*.*

d) Each measurement is a single integer value.

e) RRU.PrbUsedDlDSS.LTE

f) NRCELLDU

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the DL PRB load of the radio physical layer at Dynamic Spectrum Sharing scenario.

##### 5.1.1.2.G DL total available NR PRB for Dynamic Spectrum Sharing

a) This measurement provides the total available number of physical resource blocks (PRBs) in NR cell downlink Dynamic Spectrum Sharing from LTE Spectrum.

b) CC.

c) The measurement is obtained total available PRBs available for NR cell when downlink Dynamic Spectrum Sharing*.*

d) Each measurement is a single integer value.

e) RRU.PrbAvailDlDSS*.*

f) NRCELLDU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for monitoring the total number of available PRBs in downlink at Dynamic Spectrum Sharing scenario.

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# A.6 Monitoring of physical radio resource utilization

The physical radio resource utilization measurements could provide operators the load information of the radio network during the measurement time period. The physical radio resource utilization measurements should reflect the average usage and the usage distribution of the radio resource of the physical layer. The measurements can make the operator to be aware of whether a cell has ever experienced high load or not in the monitoring period, and is a key input to network capacity planning and load balancing.

Monitoring physical radio resource utilization of NR dynamic spectrum sharing from LTE spectrum is helpful for operators to be aware of the load.

When NR UE is connecting to NR Cell using initial BWP (only 48 PRBs), if the PRB usage is too high because of a lot of UEs access in the NR cell, the delay of UE accessing to the network will be increased. Monitoring the physical radio resource utilization of initial BWP is helpful for operators to be aware of the load.

Network slicing is an important feature in 5GS, monitoring physical radio resource utilization per S-NSSAI is helpful for opeators to be aware of the load.

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| **End of modifications** |