**3GPP TSG- Meeting # *rev4***

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| *CR-Form-v12.0* | | | | | | | | |
| **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 |  | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Source to WG:*** | , Intel | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***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 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:*** | | Measurements with respect to “Received Random Access Preambles” are today missing in TS 28.552 measurement specification. Those “Received Random Access Preambles” measurements are needed for evaluation of RACH performance in gNB-DU. A use case for these measurements are RACH configuration optimization, where Received Random Access Preambles is signalled across an OAM interface.  Those measurement are defined in RAN L2 measurements specification TS 38.314. In TS 38.314 those measurements are named “Received Random Access Preambles per cell” and “Received Random Access Preambles per SSB”. | | | | | | | | |
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| ***Summary of change:*** | | Two measurement is added and an UC description:  Received Random Access Preambles per cell and per SSB:  These measurements are applicable to RACH. The reference point is the Service Access Point between MAC and L1. The measured quantity is the number of received Random Access preambles during a time period over all RACHs configured in a cell. The measurement is done separately for: (low/high range is defined in TS 38.321)  - Dedicated preambles  - Randomly selected preambles in the low range  - Randomly selected preambles in the high range.  The unit of the measured value is [/s].  An UC description for “Monitoring of RACH Usage” is added. | | | | | | | | |
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| ***Consequences if not approved:*** | | It will not be possible to monitor the Received Random Access Preambles. | | | | | | | | |
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| ***Clauses affected:*** | | 2, 3.4, 5.1.1.x(new), 5.1.1.x.1(new), 5.1.1.x.2(new), A.x(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)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | | The measurements in TS 32.425 (for LTE) has been used as “base” for these defined. | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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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 38.314: "NR; Layer 2 Measurements”

[z] 3GPP TS 38.313: "Self-Organizing Networks (SON) for 5G networks”

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| **Next modified section** |

## 3.4 Measurement family

The measurement names defined in the present document are all beginning with a prefix containing the measurement family name. This family name identifies all measurements which relate to a given functionality and it may be used for measurement administration.

The list of families currently used in the present document is as follows:

- DRB (measurements related to Data Radio Bearer).

- RRC (measurements related to Radio Resource Control).

- UECNTX (measurements related to UE Context).

- RRU (measurements related to Radio Resource Utilization).

- RM (measurements related to Registration Management).

- SM (measurements related to Session Management).

- GTP (measurements related to GTP Management).

- IP (measurements related to IP Management).

- PA (measurements related to Policy Association).

- MM (measurements related to Mobility Management).

- VR (measurements related to Virtualized Resource).

- CARR (measurements related to Carrier).

- QF (measurements related to QoS Flow).

- AT (measurements related to Application Triggering).

- SMS (measurements related to Short Message Service).

- PEE (measurements related to Power, Energy and Environment).

- NFS (measurements related to NF sevice).

- PFD (measurements related to Packet Flow Description).

- RACH (measurements related to Random Access Channel)

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#### 5.1.1.x Received Random Access Preambles

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##### 5.1.1.x.1 Received Random Access Preambles per cell

a) This measurement provides the average (arithmetic mean) number of RACH preambles received in a cell. Separate counts are provided for dedicated preambles, randomly chosen preambles in group A (aka “low range”) and randomly chosen preambles in group B (aka “high range”).

b) DER (n=1)

c) This measurement is obtained by collecting the measurements of “Received Random Access Preambles per cell” where the unit of measured value is per second, as defined in 38.314 [x] in the granularity period, and then taking the arithmetic mean of these measurements. Separate measurements will be obtained based on the following measurements contained in “Received Random Access Preambles per cell” measurement:

- Dedicated preambles

- Randomly selected preambles in the low range

- Randomly selected preambles in the high range.

d) Each counter is an integer value. The number of measurements is equal to three.

e) RACH.PreambleDedCell

RACH.PreambleACell

RACH.PreambleBCell

f) NRCellDU

g) Valid for packet switched traffic.

h) 5GS

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality) and to support RACH optimization (see TS 28.313 [z]).

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##### 5.1.1.x.2 Received Random Access Preambles per SSB

a) This measurement provides the average (arithmetic mean) number of RACH preambles received in a cell per SSB. Separate counts are provided for dedicated preambles, randomly chosen preambles in group A (aka “low range”) and randomly chosen preambles in group B (aka “high range”).

b) DER (n=1)

c) This measurement is obtained by collecting the measurements of “Received Random Access Preambles per SSB” where the unit of measured value is per second, as defined in 38.314 [x] in the granularity period, and then taking the arithmetic mean of these measurements. Separate measurements will be obtained based on the following measurements contained in “Received Random Access Preambles per cell” measurement:

- Dedicated preambles

- Randomly selected preambles in the low range

- Randomly selected preambles in the high range.

d) Each counter is an integer value. The number of measurements is equal to three times the number of SSB beams defined in the cell.

e) RACH.PreambleDed.*Ssb,* where *Ssb* represents the subcounter associated with SSB.

RACH.PreambleA.*Ssb,* where *Ssb* represents the subcounter associated with SSB.

RACH.PreambleB.*Ssb,* where *Ssb* represents the subcounter associated with SSB.

f) NRCellDU

g) Valid for packet switched traffic.

h) 5GS

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality) and to support RACH optimization (see TS 28.313 [z]).

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# A.x Monitoring of RACH Usage

The RACH plays a vital role in the following procedures:

- Initial access from RRC\_IDLE;

- Initial access after radio link failure;

- Handover requiring random access procedure;

- DL data arrival during RRC\_CONNECTED requiring random access procedure;

- UL data arrival during RRC\_CONNECTED requiring random access procedure;

Furthermore, the random access procedure takes two distinct forms:

- Contention based using a randomly selected preamble (applicable to all five events);

- Non-contention based using a dedicated preamble (applicable to only handover and DL data arrival).

In the use-case of RACH configuration optimization, received Random Access Preambles and a contention indicator are signalled across an OAM interface.

Monitoring of the preamble usage in a cell allows the operator to determine if the resources allocated to the RACH by the gNodeB are appropriate for the number of random access attempts. If the resources are underutilised, then the operator may reconfigure the gNodeB (via CM) to allocate less resource to RACH thereby freeing up resource for other uplink transmissions. Alternatively, if the resources are heavily utilised then this is indicative of RACH congestion leading to increased latency for the procedures listed above. To this effect, measurements directly reflecting RACH congestion experienced by the gNodeB and by the UEs are useful.

The gNodeB can partition the RACH resource between dedicated preambles, randomly selected preambles in group A and randomly selected preambles in group B. This partitioning can be evaluated when usage measurements are made on each set separately. In a cell configured with multiple SSBs, it is important to get the measurements per SSB.