**3GPP TSG- Meeting #132-e *S5-204114***

**August 17 – 28, 2020** *s5-2abcde*

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| *CR-Form-v11.4* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **28.552** | **CR** | **0004** | **rev** | **-** | **Current version:** | **16.6.0** |  |
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| *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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Add measurements related to RACH optimization | | | | | | | | | |
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| ***Source to WG:*** | Intel | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SON\_5G | | | | |  | ***Date:*** | | | 2020-08-07 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | The measurements of probability distribution (e.g. UE access delay, number of attempts, …) and percentage of unsuccessful random-access are essential for RACH optimization SON function to monitor the RACH performance, and determine actions to optimize the RACH performance. | | | | | | | | |
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| ***Summary of change:*** | | Add the following measurements:  • Distribution of RACH preambles sent  • Distribution of RACH access delay | | | | | | | | |
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| ***Consequences if not approved:*** | | RACH optimization SON function cannot be completed | | | | | | | | |
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| ***Clauses affected:*** | | Add subclauses to 5.1.1.20, and text to Annex A.59 | | | | | | | | |
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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** |

# 5 Performance measurements for 5G Network Functions

#### 5.1.1.20 Received Random Access Preambles

##### 5.1.1.20.a Distribution of RACH preambles sent

a) This measurement provides the distribution of the number of RACH preambles UE sent to attach the network, based on the *RA-Report-r16* IEs in *UEInformationResponse-r16* message (see TS 38.331 [20]).

b) CC.

c) The measurement is obtained by incrementing the measurement bin that is identified by *Bin* that corresponds to the total number of preambles sent on SSB(s) =

, where

“*n*” equals to the number of SSB(s),

“*numOfPreamblesPerSSB”* equals to *numberOfPreamblesSentOnSSB-r16* attribute in *PerRASSBInfo-r16* IE.

d) Each measurement is an integer value.

e) RACH.PreambleDistribution.*Bin*

where *Bin* is to identify the bin associated with the aggregate of the number of preambles sent on SSB(s).

NOTE: Number of *Bin* and the range for each bin is left to implementation.

f) NRCellCU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is to support RACH optimization (see TS 28.313 [30]).

##### 5.1.1.20.b Distribution of RACH access delay

a) This measurement provides the distribution of the RACH access delay that is the interval from the time a UE sends its first RACH preamble until the UE is attached to the network. based on the *RA-Report-r16* IEs in *UEInformationResponse-r16* message (see TS 38.331 [20]).

b) CC.

c) The measurement is obtained by incrementing the measurement bin that is identified by *Bin* that corresponds to the access delay that is calculated by the product of the total number of preambles sent on SSB(s) and the duration of sending a preamble.

NOTE: The calculation of the access delay from the product of the total number of preambles sent is left to implementation.

d) Each measurement is an integer value.

e) RACH.AccessDelayDistribution.*Bin*

where *Bin* is to identify the bins associated with the RACH access delay.

NOTE: *Bin* and the range for each bin is left to implementation.

f) NRCellCU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is to support RACH optimization (see TS 28.313 [30]).

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| **Next Modified Section** |

# A.59 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, via measurements, such as distribution of UE access delay and the RACH preambles sent, 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.

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| **End of Modified Sections** |