**3GPP TSG-SA5 Meeting #156 *S5-244943***

**Maastricht, Netherlands, 19th Aug 2024 - 23rd Aug 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **0011** | **rev** | **1** | **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:***  | Rel-18 CR TS 28.558 corrections on the loss rate measurements and the UE identifer |
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| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | S5 |
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| ***Work item code:*** | PM\_KPI\_5G\_Ph3 |  | ***Date:*** | 2024-07-17 |
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| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *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 canbe 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 measurements “UL PDCP SDU Loss Rate” is used for split gNB deployment scenario, so it should be measured by GNBCUUPFunction and NRCellDU. In addition, there is a misalignment between the TS 28.552 and TS 28.558 regarding which entity performs the measurements. We propose to correct the content of f) to align with TS 28.552.
* According to the LS R3-243941, RAN3 made the observations about “S-TMSI” should be modified to “5G-S-TMSI”.
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| ***Summary of change:*** | * Correct the content of f) with adding “NRCellCU” in clause 6.3.1.3.1.
* Replace ‘S-TMSI’ with ‘5G-S-TMSI’.
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| ***Consequences if not approved:*** | Incorrect statements may cause wrong implementation. |
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| ***Clauses affected:*** | 6.3.1.1.1, 6.3.1.1.2, 6.3.1.1.3, 6.3.1.1.4, 6.3.1.1.5, 6.3.1.1.6, 6.3.1.1.7, 6.3.1.1.8, 6.3.1.2.1, 6.3.1.2.2, 6.3.1.3.1, 6.3.1.3.2, 6.3.1.3.3, 6.3.1.4.1, 6.3.1.4.2 |
|  |  |
|  | **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:*** |  |

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| **1st change** |

### 6.3.1 UE level measurements definitions for gNB

#### 6.3.1.1 Packet delay

##### 6.3.1.1.1 Average delay DL air-interface

a) This measurement provides the average (arithmetic mean) time it takes for packet transmission over the air-interface in the downlink direction. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D1 (see TS 38.314 [8]) as part of DL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained as: sum of (point in time when the last part of an RLC SDU packet was sent to the UE which was consequently confirmed by reception of HARQ ACK from UE for UM mode or point in time when the last part of an RLC SDU packet was sent to the UE which was consequently confirmed by reception of RLC ACK for AM mode, minus time when corresponding RLC SDU part arriving at MAC layer) divided by total number of RLC SDUs transmitted to UE successfully. The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of QoS levels multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.AirIfDelayDlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

##### 6.3.1.1.2 Average delay DL in gNB-DU

a) This measurement provides the average (arithmetic mean) RLC SDU delay on the downlink within the gNB-DU, for initial transmission of all RLC packets. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D2 (see TS 38.314 [8]) as part of DL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained as: sum of (time when the last part of an RLC SDU was scheduled and sent to the MAC layer for transmission over the air, minus time of arrival of the same packet at the RLC ingress F1-U termination) divided by total number of RLC SDUs arriving at the RLC ingress F1-U termination. If the RLC SDU needs retransmission (for Acknowledged Mode) the delay will still include only one contribution (the original one) to this measurement. The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of QoS levels multiplied by the number of S-NSSAIs.
[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.RlcSduDelayDlUe.*Filter*,
Where Filter is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

##### 6.3.1.1.3 Average delay DL on F1-U

a) This measurement provides the average (arithmetic mean) GTP packet delay DL on the F1-U interface. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D3 (see TS 38.314 [8]) as part of DL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained as: the time when receiving a GTP packet from the gNB-DU at the ingress GTP termination of GNBCUUPFunction, minus time when the same packet was sent to gNB-DU from the GTP egress termination of GNBCUUPFunction, minus feedback delay time (including queuing delay) in gNB-DU, obtained result is divided by two. The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.



Figure 6.3.1.1.3-1 Average delay DL on F1U

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of QoS levels multiplied by the number of S-NSSAIs.
 [Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.PdcpF1DelayDlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) GNBCUUPFunction

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

NOTE : The NR RAN container (DL USER DATA/ DL DATA DELIVERY STATUS) carried in the GTP-U packet over the F1-U interface is used for the measurement.

##### 6.3.1.1.4 Average delay DL in CU-UP

a) This measurement provides the average (arithmetic mean) PDCP SDU delay on the downlink within the gNB-CU-UP, for all PDCP packets. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D4 (see TS 38.314 [8]) as part of DL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained as: sum of (time when sending a PDCP SDU to the gNB-DU at the egress PDCP layer on F1-U/Xn-U, minus time of arrival of the same packet at NG-U ingress IP termination) divided by total number of PDCP SDUs arriving at NG-U ingress IP termination. The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of QoS levels multiplied by the number of S-NSSAIs.
[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.PdcpSduDelayDlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) GNBCUUPFunction

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

##### 6.3.1.1.5 UL PDCP packet average delay

a) This measurement provides the average (arithmetic mean) UL PDCP packet average delay. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D1 (see TS 38.314 [8]) as part of UL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained according to the definition in clause 4.3.1.1 of TS 38.314 [8], named "UL PDCP Packet Average Delay per DRB per UE". The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of QoS levels multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.PdcpDelayUlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) GNBCUUPFunction

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

##### 6.3.1.1.6 Average delay UL on over-the-air interface

a) This measurement provides the average (arithmetic mean) over-the-air packet delay on the uplink. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D2.1 (see TS 38.314 [8]) as part of UL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained according to the definition in clause 4.2.1.2.2 of TS 38.314 [8], named "Average over-the-air interface packet delay in the UL per DRB per UE". The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of QoS levels multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.AirIfDelayUlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU.

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

##### 6.3.1.1.7 Average RLC packet delay in the UL

a) This measurement provides the average (arithmetic mean) RLC packet delay on the uplink, i.e., the delay within the gNB-DU. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D2.2 (see TS 38.314 [8]) as part of UL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained according to the definition in clause 4.2.1.2.3 of TS 38.314 [8], named "Average RLC packet delay in the UL per DRB per UE". The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in the unit 0.1 milliseconds. The number of measurements is equal to the number of QoS levels multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.RlcDelayUlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU.

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

##### 6.3.1.1.8 Average PDCP re-ordering delay in the UL

a) This measurement provides the average (arithmetic mean) PDCP re-ordering delay on the uplink, i.e., the delay within the gNB-CU-UP. The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as D2.4 (see TS 38.314 [8]) as part of UL M6 measurement (see TS 37.320 [9]).

b) DER (n=1)

c) This measurement is obtained according to the definition in clause 4.2.1.2.4 of TS 38.314 [8], named "Average PDCP re-ordering delay in the UL per DRB per UE”. The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in the unit 0.1 milliseconds. The number of measurements is equal to the number of QoS levels multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.PdcpReordDelayUlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) GNBCUUPFunction

g) N/A.

h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS [23.288](https://www.3gpp.org/dynareport/23288.htm) [7]).

#### 6.3.1.2 Packet Loss for all gNB deployment scenario

##### 6.3.1.2.1 DL Packet Loss Rate on Uu

a) This measurement provides the DL Packet (i.e., RLC SDU) Loss rate on Uu interface. The measurement is split into subcounters per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI. This measurement is also referred to as DL M7 in TS 37.320 [9].

b) CC

c) This measurement is obtained according to the definition in clause 4.2.1.5.1 of TS 38.314 [8], named "Packet Uu Loss Rate in the DL per DRB per UE". The measurement is performed per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer value. The number of measurements is equal to the number of QoS levels multiplied by the number of supported S-NSSAIs.

e) DRB.PacketLossRateUuDlUe.*Filter*,
Where *Filter* is a combination of QoS level and S-NSSAI, QoS level represents the mapped 5QI or QCI level, and *SNSSAI* represents S-NSSAI.

f) NRCellDU

g) N/A

h) One usage of this measurement is to support ML training and performance evaluation.

#### 6.3.1.3 Packet loss for split gNB deployment scenario

##### 6.3.1.3.1 UL PDCP SDU Loss Rate

a) This measurement provides the fraction of PDCP SDU packets which are not successfully received at gNB-CU-UP. It is a measure of the UL packet loss including any packet losses in the air interface, in the gNB-CU and on the F1-U interface. Only user-plane traffic (DTCH) and only PDCP SDUs that have entered PDCP (and given a PDCP sequence number) are considered. The measurement is optionally split into subcounters per QoS level (mapped 5QI or QCI in NR option 3), and subcounters per supported S-NSSAI. This measurement is also referred to as UL M7 in TS 37.320 [9].

b) SI

c) This measurement is obtained as: 1,000,000\* Number of missing UL PDCP sequence numbers, representing packets that are not delivered to higher layers, of a data radio bearer, divided by Total number of UL PDCP sequence numbers (also including missing sequence numbers) of a bearer, starting from the sequence number of the first packet delivered by UE PDCP to gNB-CU-UP until the sequence number of the last packet. If transmission of a packet might continue in another cell, it shall not be included in this count. Separate counters are optionally maintained for mapped 5QI (or QCI for NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer value representing the loss rate multiplied by 1E6. The number of measurements is equal to one. If the optional QoS and S-NSSAI level measurements are performed, the measurements are equal to the number of mapped 5QIs and the number of supported S-NSSAIs.

e) The measurement name has the form DRB.PacketLossRateUlUe, and optionally
DRB.PacketLossRateUlUe.*QoS* where *QoS* identifies the target quality of service class, and DRB.PacketLossRateUlUe.*SNSSAI* where *SNSSAI* identifies the S-NSSAI.

f) GNBCUUPFunction;

g) N/A

h) One usage of this measurement is to support ML training and performance evaluation.

##### 6.3.1.3.2 UL F1-U Packet Loss Rate

a) This measurement provides the fraction of PDCP SDU packets which are not successfully received at gNB-CU-UP. It is a measure of the UL packet loss on the F1-U interface. The measurement is optionally split into subcounters per QoS level (mapped 5QI or QCI in NR option 3) and subcounters per supported S-NSSAI. This measurement is also referred to as UL M7 in TS 37.320 [9].

b) SI

c) This measurement is obtained as: 1,000,000\* Number of missing UL GTP sequence numbers (TS 29.281 [15]), representing packets that are not delivered to higher layers, of a data radio bearer, divided by Total number of UL GTP sequence numbers (also including missing sequence numbers) of a bearer, starting from the GTP sequence number of the first packet delivered by gNB-DU to gNB-CU-UP until the GTP sequence number of the last packet. Separate counters are optionally maintained for mapped 5QI (or QCI for option 3) and per supported S-NSSAI.

d) Each measurement is an integer value representing the loss rate multiplied by 1E6. The number of measurements is equal to one. If the optional QoS and S-NSSAI level measurement are performed, the measurements are equal to the number of mapped 5QIs and the number of supported S-NSSAIs.

e) The measurement name has the form DRB.F1UpacketLossRateUlUe, and optionally DRB.F1UPacketLossRateUlUe.*QoS* where *QoS* identifies the target quality of service class, and DRB.F1UPacketLossRateUlUe.*SNSSAI* where *SNSSAI* identifies the S-NSSAI.

f) GNBCUUPFunction

g) N/A

h) One usage of this measurement is to support ML training and performance evaluation.

##### 6.3.1.3.3 DL F1-U Packet Loss Rate

a) This measurement provides the fraction of PDCP SDU packets which are not successfully received at the gNB-DU). It is a measure of the DL packet loss on the F1-U interface. The measurement is optionally split into subcounters per QoS level (mapped 5QI or QCI in NR option 3), and subcounters per supported S-NSSAI. This measurement is also referred to as DL M7 in TS 37.320 [9].

b) SI

c) This measurement is obtained as: 1,000,000\* Number of missing DL GTP sequence numbers (TS 29.281 [15]), representing packets that are not delivered to lower layers, of a data radio bearer, divided by Total number of UL GTP sequence numbers (also including missing sequence numbers) of a bearer, starting from the sequence number of the first packet delivered by gNB-CU-UP to gNB-DU until the GTP sequence number of the last packet. Separate counters are optionally maintained for mapped 5QI (or QCI for NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer value representing the loss rate multiplied by 1E6. The number of measurements is equal to one. If the optional QoS and S-NSSAI level measurement are performed, the measurements are equal to the number of mapped 5QIs and the number of supported S-NSSAIs.

e) The measurement name has the form DRB.F1UpacketLossRateDlUe, and optionally DRB.F1UPacketLossRateDlUe.*QoS* where *QoS* identifies the target quality of service class, and DRB.F1UPacketLossRateDlUe.*SNSSAI* where *SNSSAI* identifies the S-NSSAI.

f) NRCellDU

g) N/A

h) One usage of this measurement is to support ML training and performance evaluation.

#### 6.3.1.4 UE throughput

##### 6.3.1.4.1 Average DL UE throughput in gNB

a) This measurement provides the average UE throughput in downlink. This measurement is intended for data bursts that are large enough to require transmissions to be split across multiple slots. The UE data volume refers to the total volume scheduled for each UE regardless of if using only primary- or also supplemental aggregated carriers. The measurement is optionally split into subcounters per QoS level (mapped 5QI or QCI in NR option 3) and subcounters per supported S-NSSAI. This measurement is also referred to as DL M5 in TS 37.320 [9].

b) DER(N=1)

c) This measurement is obtained according to the following formula based on the "ThpVolDl" and "ThpTimeDl" defined below. Separate counters are maintained for each mapped 5QI (or QCI for option 3) and for each supported S-NSSAI.

If $\sum\_{}^{}ThpTimeDl>0$,$ \frac{\sum\_{}^{}ThpVolDl}{\sum\_{}^{}ThpTimeDl}$×1000 [kbit/s]

If $\sum\_{}^{}ThpTimeDl=0$, 0 [kbit/s]

For small data bursts, where all buffered data is included in one initial HARQ transmission,, otherwise 

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| ThpTimeDl | The time to transmit a data burst excluding the data transmitted in the slot when the buffer is emptied. A sample of "ThpTimeDl" for each time the DL buffer for one Data Radio Bearer (DRB) is emptied. |
|  | The point in time after T2 when data up until the second last piece of data in the transmitted data burst which emptied the RLC SDU available for transmission for the particular DRB was successfully transmitted, as acknowledged by the UE.  |
|  | The point in time when the first transmission begins after a RLC SDU becomes available for transmission, where previously no RLC SDUs were available for transmission for the particular DRB. |
|  | The RLC level volume of a data burst, excluding the data transmitted in the slot when the buffer is emptied. A sample for ThpVolDl is the data volume, counted on RLC SDU level, in kbit successfully transmitted (acknowledged by UE) in DL for one DRB during a sample of ThpTimeDl. (It shall exclude the volume of the last piece of data emptying the buffer). |

d) Each measurement is a real value representing the throughput in kbit per second. The number of measurements is equal to one. If the optional QoS level subcounter and S-NSSAI subcounter are performed, the number of measurements is equal to the number of mapped 5QIs and the number of supported S-NSSAIs.

e) The measurement name has the form
DRB.UEThpDl, or optionally
DRB.UEThpDl.*QoS,* where *QoS* identifies the target quality of service class, and
DRB.UEThpDl.*SNSSAI,* where *SNSSAI* identifies the S-NSSAI.

f) NRCellDU

g) N/A

h) One usage of this measurement is to support ML training and performance evaluation.

##### 6.3.1.4.2 Average UL UE throughput in gNB

a) This measurement provides the average UE throughput in uplink. This measurement is intended for data bursts that are large enough to require transmissions to be split across multiple slots. The UE data volume refers to the total volume scheduled for each UE regardless of using only primary- or also supplemental aggregated carriers. The measurement is optionally split into subcounters per QoS level (mapped 5QI or QCI in NR option 3) and subcounters per supported S-NSSAI. This measurement is also referred to as UL M5 in TS 37.320[9].

B) DER(N=1)

c) This measurement is obtained according to the following formula based on the "ThpVolUl" and "ThpTimeUl" defined below. Separate counters are maintained for each mapped 5QI (or QCI for option 3) and for each supported S-NSSAI.

If $\sum\_{}^{}ThpTimeUl>0$, $\frac{\sum\_{}^{}ThpVolUl}{\sum\_{}^{}ThpTimeUl}$×1000 [kbit/s]

If $\sum\_{}^{}ThpTimeUl=0$, 0 [kbit/s]

For small data bursts, where all buffered data is included in one initial HARQ transmission otherwise 

|  |  |
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| ThpTimeUl | The time to transmit a data burst excluding the data transmitted in the slot when the buffer is emptied. A sample of "ThpTimeUl" for each time the UL buffer for one Data Radio Bearer (DRB) is emptied. |
|  | The point in time when the data up until the second last piece of data in data burst has been successfully received for a particular DRB  |
|  | The point in time when transmission is started for the first data in data burst for a particular DRB. |
|  | The RLC level volume of a data burst, excluding the data transmitted in the slot when the buffer is emptied. A sample for ThpVolUl is the data volume counted on RLC SDU level in kbit received in UL for one DRB during a sample of ThpTimeUl, (It shall exclude the volume of the last piece of data emptying the buffer). |

d) Each measurement is a real value representing the throughput in kbit per second. The number of measurements is equal to one. If the optional QoS level subcounter and S-NSSAI subcounter are performed, the number of measurements is equal to the number of mapped 5QIs and the number of supported S-NSSAIs.

e) The measurement name has the form
DRB.UEThpUl, or optionally
DRB.UEThpUl.*QoS,* where *QoS* identifies the target quality of service class, and
DRB.UEThpUl.*SNSSAI,* where *SNSSAI* identifies the S-NSSAI.

f) NRCellDU

g) N/A

h) One usage of this measurement is to support ML training and performance evaluation.

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| --- |
| **End of change** |