

**TSG-RAN Meeting #16**  
**Marco Island, FL, USA, 4 - 7 June 2002**

***RP-020381***

**Proposed CR 1484r1 (R'99), CR 1485r1 (Rel-4 Category A) and CR 1486r1 (Rel-5 Category A) to TS 25.331 on Traffic Volume Measurements (Qualcomm, Ericsson)**

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## CHANGE REQUEST

⌘ **25.331 CR 1484** ⌘ rev **1** ⌘ Current version: **3.a.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Traffic Volume Measurement correction		
<b>Source:</b>	⌘ Qualcomm, Ericsson, Sasken		
<b>Work item code:</b>	⌘	<b>Date:</b>	⌘ 22.01.2002
<b>Category:</b>	⌘ <b>F</b>	<b>Release:</b>	⌘ R99
	<i>Use <u>one</u> of the following categories:</i> <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .		<i>Use <u>one</u> of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

**Reason for change:** ⌘ The current description is unclear and does not match the group's understanding of how it should work.

- Summary of change:** ⌘
- Clarified the distinction between the set of transport channels the UE is supposed to report on and the set of transport channels it is supposed to trigger on. The two sets can be completely disjoint.
  - Clarified the cases in which the configuration should be rejected.
  - Aligned the name of one Multiplicity value with what is in the Tabular.
  - Moved the text dealing with the generation of reports to section 14 (to align with other measurements).
  - Clarified that the Pending-time-after trigger applied per event rather than per measurement ID (to align with the signalling).
  - Corrected the Interruption of user data transmission to align it with the understanding of the group.
  - Clarified what the UE should report on when an RB is mapped onto two logical channels (as per the agreement in the previous meeting).
  - Specified that when the set of TrCHs on which an event trigger is defined is not provided explicitly, the UE shall apply it on the TrCHs specified by the measurement object.
  - Specified when the Pending-time-after-trigger timer needed to be started.
  - Corrected some of the interactions between the time-to-trigger and Pending-time-after-trigger mechanisms.
  - Clarified that at most one Time-to-trigger and Pending-time-after-trigger was needed for each configured event.

- Aligned the name of the event 4a with its behavior.
- Corrected a number of editorial errors.

**Impact Analysis:**

This CR has limited impact to traffic volume measurement functionality and is consistent with RAN2 understanding. However, since the specification is currently unclear, if a UE has implemented something different it may:

- If this CR is not implemented in the UE:
  - o It will not reject some configurations, which are ambiguous.
  - o It will not re-start its transmission on RACH after the time "Tx Interruption after trigger" elapses and it is not in CELL\_DCH.
  - o It will provide traffic volume measurements for a set of transport channels which is not exactly what the UTRAN intended.
- If not implemented in the network:
  - o It will receive traffic volume measurement reports which do not match exactly what it expects.
  - o The UE may re-start uplink transmission on RACH before what the UTRAN expects.

**Consequences if not approved:** ⌘ Unclear and inconsistent specifications rendering correct TVM configuration and thus RRM operation impossible.

**Clauses affected:** ⌘ 8.6.7.10, 8.6.7.11, 10.3.10, 14.4.1, 14.4.2, 14.4.2.1, 14.4.2.2, 14.4.3.1, 14.4.3.x(new) , 14.4.4

**Other specs affected:** ⌘  Other core specifications ⌘   
 Test specifications  
 O&M Specifications

**Other comments:** ⌘

**How to create CRs using this form:**

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.htm). Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

### 8.6.7.10 Traffic Volume Measurement

If the IE "Traffic Volume Measurement" is received by the UE, the UE shall:

- 1> store the content of the IE to the variable MEASUREMENT\_IDENTITY.

~~If the IE "Traffic volume measurement Object" is not included, the UE shall:~~

- ~~1> apply the measurement reporting criteria to all uplink transport channels.~~

If IE "Traffic volume measurement" is received by the UE in a MEASUREMENT CONTROL message, where IE "measurement command" has the value "setup", and if the IE "traffic volume reporting quantity" is included, the UE shall:

- ~~1> report the measured quantities specified in the IE "traffic volume reporting quantity";~~

- 1> if the parameter "Average of RLC Buffer Payload for each RB" or the parameter "Variance of RLC Buffer payload for each RB" is set to "TRUE":

- 2> if the IE "Traffic volume measurement quantity" is not included:

- 3> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

- 2> if the IE "Traffic volume measurement quantity" is included;

- ~~3> if the parameter "time interval to take an average or a variance" is included:~~

- ~~4> use the time specified in the parameter "time interval to take an average or a variance" to calculate the average and/or variance of RLC Buffer Payload according to the IE "traffic volume reporting quantity".~~

- 3> if the parameter "time interval to take an average or a variance" is not included:

- 4> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

If IE "Traffic volume measurement" is received by the UE in a MEASUREMENT CONTROL message, where IE "measurement command" has the value "setup", but IE "Traffic volume ~~measurement reporting~~ quantity" ~~or IE "Traffic volume reporting quantity"~~ is not received, the UE shall:

- ~~1> clear all stored measurement control information related associated to this measurement identity in variable MEASUREMENT\_IDENTITY;~~

- 1> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

### 8.6.7.11 Traffic Volume Measurement Reporting Criteria

If the IE "Traffic Volume Measurement Reporting Criteria" is received by the UE, the UE shall:

- 1> if the IE "Parameters sent for each transport channel" is absent:

- 2> set the variable PROTOCOL\_ERROR\_REJECT to TRUE;

- 2> set the IE "Protocol error cause" in the variable PROTOCOL\_ERROR\_INFORMATION to "Information element missing".

- 1> for each IE "Parameters sent for each transport channel":

- 2> if the IE "Parameters required for each Event" is absent:

- 3> set the variable CONFIGURATION\_INCOMPLETE to TRUE;

- ~~1> store the content of the IE "Traffic Volume Measurement Reporting Criteria" to the variable MEASUREMENT\_IDENTITY.~~

~~If the IE "UL transport channel id" is not included, the UE shall:~~

- 1> ~~apply the measurement reporting criteria to all uplink transport channels indicated in the IE "Traffic volume measurement object";~~
- 1> ~~if the UTRAN has not specified a traffic volume measurement object for a given measurement identity:~~
- 2> ~~apply the measurement reporting criteria to all uplink transport channels that are configured for the current UE state.~~

If the IE "Tx interruption after trigger" is included, the UE shall:

- 1> ~~block DTCH transmissions on the RACH during the time specified in the IE after a measurement report is transmitted.~~

### 10.3.7.71 Traffic volume measurement quantity

Contains the measurement quantity information for a traffic volume measurement.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Measurement quantity	MP		Enumerated( RLC buffer payload, Average RLC buffer payload, Variance of RLC buffer payload)	<del>The use of this parameter is described in subclause 8.6.7.10. This parameter should be ignored.</del>
Time Interval to take an average or a variance	CV-A/V		Integer(20, 40, ..260, by steps of 20)	In ms

Condition	Explanation
A/V	This IE is mandatory present when "Average RLC buffer" or "Variance of RLC buffer payload" is chosen and not needed otherwise.

### 10.3.7.72 Traffic volume measurement reporting criteria

Contains the measurement reporting criteria information for a traffic volume measurement.

Event 4a: Transport Channel Traffic Volume [15] exceeds an absolute threshold.

Event 4b: Transport Channel Traffic Volume [15] becomes smaller than an absolute threshold.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Parameters sent for each transport channel	OP	1 to <maxTrCH >		This IE is always required, need is OP to align with ASN.1
>Uplink transport channel type	OP		Enumerated(DCH,RACHorCPCH,USCH)	USCH is TDD only. CPCH is FDD only. RACHorCPCH is the currently configured default in the uplink.
>UL Transport Channel ID	CV-UL-DCH/USCH		Transport channel identity 10.3.5.18	
>Parameters required for each Event	OP	1 to <maxMeaspaerEvent >		
>>Traffic volume event identity	MP		Traffic volume event identity 10.3.7.66	
>>Reporting Threshold	MP		Enumerated(8,16,32,64,128,256,512,1024,2K,3K,4K,6K,8K,12K,16K,24K,32K,48K,64K,96K,128K,192K,256K,384K,512K,768K)	Threshold in bytes And N Kbytes = N*1024 bytes
>>Time to trigger	OP		Time to trigger 10.3.7.64	Indicates the period of time between the timing of event detection and the timing of sending Measurement Report. Time in ms
>>Pending time after trigger	OP		Integer(250, 500, 1000, 2000, 4000, 8000, 16000)	Indicates the period of time during which it is forbidden to send any new measurement reports with the same Traffic volume event identity even if the triggering condition is fulfilled. Time in milliseconds
>>Tx interruption after trigger	OP		Integer (250, 500, 1000, 2000, 4000, 8000, 16000)	Time in milliseconds. Indicates how long the UE shall block DTCH transmissions on the RACH after a measurement report is triggered.

Condition	Explanation
UL-DCH/USCH	If IE "Uplink transport channel type" is equal to "DCH" or "USCH" (TDD only) this IE is optional. Otherwise the IE is not needed.

### 10.3.10 Multiplicity values and type constraint values

The following table includes constants that are either used as multi bounds (name starting with "max") or as high or low value in a type specification (name starting with "lo" or "hi"). Constants are specified only for values appearing more than once in the RRC specification. In case a constant is related to one or more other constants, an expression is included in the "value" column instead of the actual value.

Constant	Explanation	Value
<b>CN information</b>		
maxCNdomains	Maximum number of CN domains	4
<b>UTRAN mobility information</b>		
maxRAT	Maximum number of Radio Access Technologies	maxOtherRAT + 1
maxOtherRAT	Maximum number of other Radio Access Technologies	15
maxURA	Maximum number of URAs in a cell	8
maxInterSysMessages	Maximum number of Inter System Messages	4
maxRABsetup	Maximum number of RABs to be established	16
<b>UE information</b>		
maxtransactions	Maximum number of parallel RRC transactions in downlink	25
maxPDCPalgoType	Maximum number of PDCP algorithm types	8
maxDRACclasses	Maximum number of UE classes which would require different DRAC parameters	8
MaxFreqBandsFDD	Maximum number of frequency bands supported by the UE as defined in [21]	8
MaxFreqBandsTDD	Maximum number of frequency bands supported by the UE as defined in [22]	4
MaxFreqBandsGSM	Maximum number of frequency bands supported by the UE as defined in [45]	16
maxPage1	Number of UEs paged in the Paging Type 1 message	8
MaxSystemCapability	Maximum number of system specific capabilities that can be requested in one message.	16
<b>RB information</b>		
MaxPredefConfig	Maximum number of predefined configurations	16
MaxRB	Maximum number of RBs	32
MaxSRBsetup	Maximum number of signalling RBs to be established	8
MaxRBperRAB	Maximum number of RBs per RAB	8
MaxRBallRABs	Maximum number of non signalling RBs	27
MaxRBMuxOptions	Maximum number of RB multiplexing options	8
MaxLoCHperRLC	Maximum number of logical channels per RLC entity	2
<b>TrCH information</b>		
MaxTrCH	Maximum number of transport channels used in one direction (UL or DL)	32
MaxTrCHpreconf	Maximum number of preconfigured Transport channels, per direction	16
MaxCCTrCH	Maximum number of CCTrCHs	8
MaxTF	Maximum number of different transport formats that can be included in the Transport format set for one transport channel	32
maxTF-CPCH	Maximum number of TFs in a CPCH set	16
MaxTFC	Maximum number of Transport Format Combinations	1024
maxTFCI-1-Combs	Maximum number of TFCI (field 1) combinations	512
maxTFCI-2-Combs	Maximum number of TFCI (field 2) combinations	512
maxCPCHsets	Maximum number of CPCH sets per cell	16
maxSIBperMsg	Maximum number of complete system information blocks per SYSTEM INFORMATION message	16
maxSIB	Maximum number of references to other system information blocks.	32
maxSIB-FACH	Maximum number of references to system information blocks on the FACH	8
<b>PhyCH information</b>		
maxPCPCH-APsubCH	Maximum number of available sub-channels for AP signature on PCPCH	12
maxPCPCH-CDsubCH	Maximum number of available sub-channels for CD signature on PCPCH	12
maxPCPCH-APsig	Maximum number of available signatures for AP on PCPCH	16

Constant	Explanation	Value
maxPCPCH-CDsig	Maximum number of available signatures for CD on PCPCH	16
maxAC	Maximum number of access classes	16
maxASC	Maximum number of access service classes	8
maxASCmap	Maximum number of access class to access service classes mappings	7
maxASCpersist	Maximum number of access service classes for which persistence scaling factors are specified	6
maxPRACH	Maximum number of PRACHs in a cell	16
maxFACHPCH	Maximum number of FACHs and PCHs mapped onto one secondary CCPCHs	8
maxRL	Maximum number of radio links	8
maxSCCPCH	Maximum number of secondary CCPCHs per cell	16
maxDPDCH-UL	Maximum number of DPDCHs per cell	6
maxDPCH-DLchan	Maximum number of channelisation codes used for DL DPCH	8
maxPUSCH	Maximum number of PUSCHs	(8)
maxPDSCH	Maximum number of PDSCHs	8
maxPDSCHcodes	Maximum number of codes for PDSCH	16
maxPDSCH-TFCIgroups	Maximum number of TFCI groups for PDSCH	256
maxPDSCHcodeGroups	Maximum number of code groups for PDSCH	256
maxPCPCHs	Maximum number of PCPCH channels in a CPCH Set	64
maxPCPCH-SF	Maximum number of available SFs on PCPCH	7
maxTS	Maximum number of timeslots used in one direction (UL or DL)	14
hiPUSCHidentities	Maximum number of PUSCH Identities	64
hiPDSCHidentities	Maximum number of PDSCH Identities	64
<b>Measurement information</b>		
maxTGPS	Maximum number of transmission gap pattern sequences	6
maxAdditionalMeas	Maximum number of additional measurements for a given measurement identity	4
maxMeasEvent	Maximum number of events that can be listed in measurement reporting criteria	8
MaxMeasParEvent	Maximum number of measurement parameters (e.g. thresholds) per event	2
maxMeasIntervals	Maximum number of intervals that define the mapping function between the measurements for the cell quality Q of a cell and the representing quality value	1
maxCellMeas	Maximum number of cells to measure	32
maxReportedGSMCells	Maximum number of GSM cells to be reported	6
maxFreq	Maximum number of frequencies to measure	8
maxSat	Maximum number of satellites to measure	16
HiRM	Maximum number that could be set as rate matching attribute for a transport channel	256
<b>Frequency information</b>		
maxFDDFreqList	Maximum number of FDD carrier frequencies to be stored in USIM	4
maxTDDFreqList	Maximum number of TDD carrier frequencies to be stored in USIM	4
maxFDDFreqCellList	Maximum number of neighbouring FDD cells to be stored in USIM	32
maxTDDFreqCellList	Maximum number of neighbouring TDD cells to be stored in USIM	32
maxGSMCellList	Maximum number of GSM cells to be stored in USIM	32
<b>Other information</b>		
maxNumGSMFreqRanges	Maximum number of GSM Frequency Ranges to store	32
maxNumFDDFreqs	Maximum number of FDD centre frequencies to store	8
maxNumTDDFreqs	Maximum number of TDD centre frequencies to store	8
maxNumCDMA200Freqs	Maximum number of CDMA2000 centre frequencies to store	8



## 14.4 Traffic Volume Measurements

### 14.4.1 Traffic Volume Measurement Quantity

Traffic volume measurements may be configured by RRC to assist with dynamic radio bearer control. The reported quantities that can be configured are:

- 1 Buffer Occupancy.
- 2 Average of Buffer Occupancy.
- 3 Variance of Buffer Occupancy.

A description of these values can be found in [15].

When a report is triggered, the UE shall provide the requested quantities for the acknowledged and unacknowledged mode RBs mapped onto the transport channels identified.

~~In order to support a large variation of bit rates and RLC buffer size capabilities, a non-linear scale is used. Since, for each RB, the expected traffic includes both new and retransmitted RLC PDUs and potentially existing Control PDUs, all these should be included in the Buffer Occupancy measure. It should also be noted that traffic volume measurements are only applicable for acknowledged and unacknowledged mode.~~

~~According to what is stated in the Measurement Control message, the UE should support reporting of RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload for RBs multiplexed onto the same Transport channel. The Reporting Quantities (i.e. RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload of each RB) are indicated in the measurement control message. If Average of RLC Buffer Payload or Variance of RLC Buffer Payload is included as Reporting Quantity, the time interval to take an average or a variance shall be used. When the RLC buffer payload, Average of RLC buffer payload or Variance of RLC buffer payload is reported, the measured quantity shall be rounded upwards to the closest higher value possible to report.~~

### 14.4.2 Traffic Volume reporting triggers

~~Traffic volume measurement reports can be reported-triggered using~~ in two different ways/mechanisms, periodical and event triggered. The reporting criteria are specified in the measurement control message.

~~For periodical reporting the UE simply determines the Reporting Quantities in number of bytes for each RB mapped onto the indicated transport channels and reports the results at the time interval and for the number of times specified.~~

All the specified events are evaluated with respect to the Transport Channel Traffic Volume (TCTV). This quantity is equal to the sum of the Buffer Occupancy for all logical channels mapped onto a transport channel. The events on a given transport channel shall be evaluated at least at every TTI (may be more often) as described in [15].

~~For traffic volume measurements in the UE only one quantity is compared with the thresholds. This quantity is Transport Channel Traffic Volume [15] (which equals the sum of Buffer Occupancies of RBs multiplexed onto a transport channel) in number of bytes. Event triggered reporting is performed when the Transport Channel Traffic Volume exceeds an upper threshold or becomes smaller than a lower threshold. Every TTI, UE measures the Transport Channel Traffic Volume for each transport channel and compares it with the configured thresholds. If the value is out of range, the UE determines the Reporting Quantities for the RBs mapped onto that transport channel and reports the results.~~

When a traffic volume measurement is set up, the UE shall:

- 1> if the IE "report criteria" is set to "Traffic volume measurement reporting criteria", the UE shall:
  - 2> for each IE "Parameters sent for each transport channel":
    - 3> if the IE "Uplink transport channel type" is not included; or
    - 3> if the IE "Uplink Transport Channel Type" has the value "DCH" or "USCH" and the IE "UL transport channel id" is not included, the UE shall:
      - 4> for each IE "Parameters required for each Event":

5> for each ~~configured~~ uplink transport channel on which the UE is supposed to report (see below), configure an event trigger defined by the values in the IEs “Measurement Identity”, “Traffic volume event identity”, “Reporting threshold”, “Time to trigger”, “Pending time after trigger” and “Tx Interruption after trigger”;

3> else:

4> for each IE “Parameters required for each Event”:

5> for the uplink transport channel defined by the IEs “Uplink transport channel type” and “UL transport channel id”, configure an event trigger defined by the values in the IEs “Measurement Identity”, “Traffic volume event identity”, “Reporting threshold”, “Time to trigger”, “Pending time after trigger” and “Tx Interruption after trigger”;

1> else if the IE “report criteria” is set to “Periodical reporting criteria”:

2> configure periodical triggers with period equal to the value in the IE “Reporting Interval” and with number of transmissions equal to the value in the IE “Amount of reporting” for the measurement identified by the IE “Measurement Identity”;

For each transport channel for which an event trigger has been configured, the UE shall:

1> for each event configured for this transport channel:

2> if the transport channel TCTV becomes larger than the threshold in IE “Reporting threshold”:

3> if the IE “Traffic volume event identity” has value “4a”:

4> if the IE “Time to trigger” is not present; and:

54> if there is no active Pending-time-after-trigger timer for this event is not active.;

5> if the IE “Pending time after trigger” is included, start the Pending-time-after-trigger timer for this event with the value in this IE;

5> trigger a report for the measurement identified by the IE “Measurement Identity”.

4> else:

5> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

3> else (if the IE “Traffic volume event identity” has value “4b”):

4> if the Time-to-trigger timer for this event is active:

5> stop this timer.

2> if the transport channel TCTV becomes smaller than the threshold in IE “Reporting threshold”:

3> if the IE “Traffic volume event identity” has value “4a”:

4> if the Time-to-trigger timer for this event is active:

5> stop this timer.

3> else (if the IE “Traffic volume event identity” has value “4b”):

4> if the IE “Time to trigger” is not present; and:

54> if there is no active Pending-time-after-trigger timer for this event is not active.;

5> if the IE “Pending time after trigger” is included, start the Pending-time-after-trigger timer for this event with the value in this IE;

5> trigger a report for the measurement identified by the IE “Measurement Identity”.

4> else:

5> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

When the Time-to-trigger timer for an event elapses:

1> if the Pending-time-after-trigger timer for this event is not active:

42> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

2> if the IE “Pending time after trigger” is included:

3> start the Pending-time-after-trigger timer for this event with the value in this IE;

When the Pending-time-after-trigger for an event elapses:

1> if the IE “Traffic volume event identity” has value “4a”:

2> if the transport channel TCTV is larger than the threshold in IE “Reporting threshold”:

3> if the IE “Time to trigger” is not present:

4> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

4> start the Pending-time-after-trigger timer for this event with the value in the IE “Pending time after trigger”.

3> else:

4> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

1> if the IE “Traffic volume event identity” has value “4b”:

2> if the transport channel TCTV is smaller than the threshold in IE “Reporting threshold”:

3> if the IE “Time to trigger” is not present:

4> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

4> start the Pending-time-after-trigger timer for this event with the value in the IE “Pending time after trigger”.

3> else:

4> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

When a periodical trigger elapses, the UE shall:

1> trigger a report for the measurement identified by the IE “Measurement Identity”;

1> if the number of reports triggered by this periodical trigger reaches the value in the IE “Amount of reporting”:

2> disable this periodical trigger.

When a report is triggered for a given IE “Measurement Identity”, the UE shall:

1> consider the variable MEASUREMENT\_IDENTITY corresponding to this measurement identity;

1> if the report is triggered by an event trigger:

2> include the IE “Event results”;

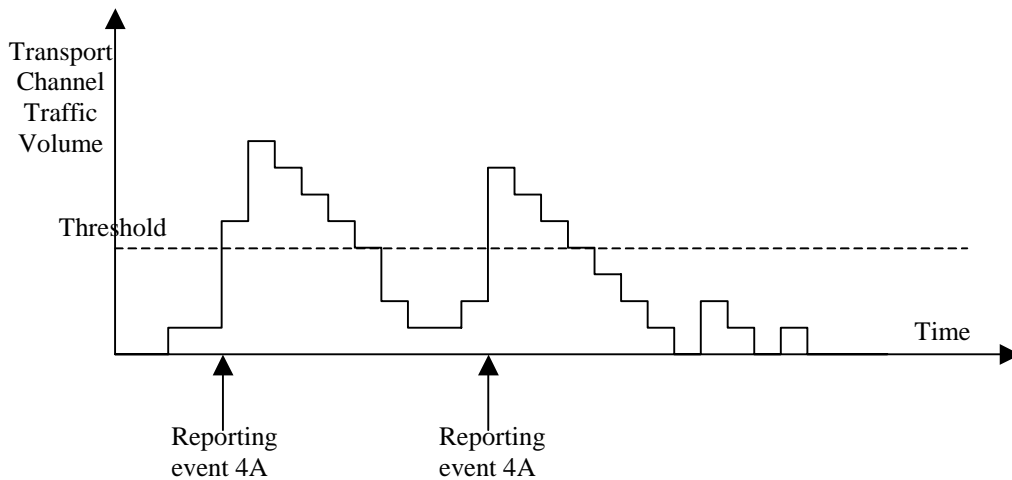
2> set the IE “Uplink transport channel type causing the event” to the type of the transport channel which triggered the report;

2> if the transport channel type is “DCH” or “USCH”:

- 3> include the IE “UL Transport Channel identity” and set it to the identity of the transport channel which triggered the report;
- 2> else:
  - 3> do not include the IE “UL Transport Channel identity”;
  - 2> set the IE “Traffic volume event identity” to the identity of the event that triggered the report;
  - 2> if the IE “Tx interruption after trigger” for the event that triggered the report is included:
    - 3> if the UE is in CELL\_FACH state:
      - 4> prohibit DTCH transmissions on the RACH;
      - 4> resume these transmissions when:
        - 5> it receives from the UTRAN a message causing the transition to CELL\_DCH state; or
        - 5> the time period indicated in the IE “Tx interruption after trigger” elapses;
- 1> if the IE “Traffic volume measurement object” is not included, the UE shall:
  - 2> report on all the uplink transport channels as specified below;
- 1> if the IE “Traffic volume measurement object” is included, the UE shall:
  - 2> report on the uplink transport channels identified in this IE as specified below;
- 1> for each UM or AM RB mapped onto a transport channel on which the UE is expected to report, the UE shall:
  - 2> add an element in the IE “Traffic volume measurement results”;
  - 2> set the value of the IE “RB Identity” to the identity of the considered radio bearer;
  - 2> if the RB is mapped onto one logical channel:
    - 3> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “RLC Buffers Payload” and set it to the Buffer Occupancy value for this logical channel, rounded up to the next allowed value;
    - 3> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “Average of RLC Buffer Payload” and set it to the Buffer Occupancy for this logical channel averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
    - 3> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the Buffer Occupancy for this logical channel computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
  - 2> if the RB is mapped onto two logical channels:
    - 3> if one logical channel is mapped onto transport channels on which the UE is supposed to report:
      - 4> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
        - 5> include the IE “RLC Buffers Payload” and set it to the Buffer Occupancy value for this logical channel, rounded up to the next allowed value;
      - 4> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
        - 5> include the IE “Average of RLC Buffer Payload” and set it to the Buffer Occupancy for this logical channel averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;

- 4> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
  - 5> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the Buffer Occupancy for this logical channel computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
- 3> else (if both logical channels are mapped onto transport channels on which the UE is supposed to report):
  - 4> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
    - 5> include the IE “RLC Buffers Payload” and set it to the sum of the Buffer Occupancy values for the two logical channels, rounded up to the next allowed value;
  - 4> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
    - 5> include the IE “Average of RLC Buffer Payload” and set it to the sum of the Buffer Occupancy for the two logical channels averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]) and rounded up to the next allowed value;
  - 4> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
    - 5> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the sum of the Buffer Occupancy for the two logical channels, computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]) and rounded up to the next allowed value;

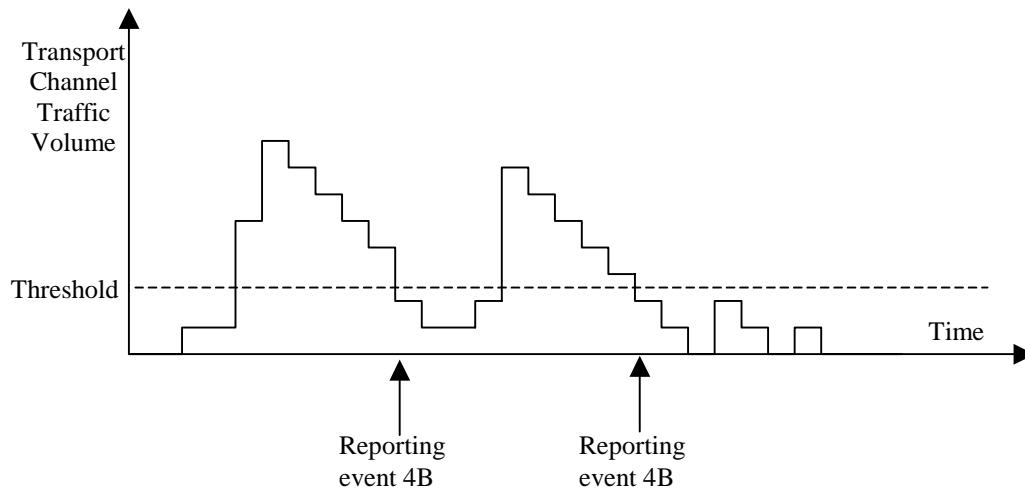
14.4.2.1 Reporting event 4 A: Transport Channel Traffic Volume ~~exceeds~~becomes larger than an absolute threshold



**Figure 14.4.2.1-1: Event triggered report when Transport Channel Traffic Volume ~~exceeds~~becomes larger than a certain threshold**

If the monitored Transport Channel Traffic Volume [15] ~~exceeds~~becomes larger than an absolute threshold, i.e. if  $TCTVF > \text{Reporting threshold}$ , this is an event that could trigger a report. ~~The corresponding report specifies at least which measurement ID the event that triggered the report belongs to.~~

#### 14.4.2.2 Reporting event 4 B: Transport Channel Traffic Volume becomes smaller than an absolute threshold



**Figure 14.4.2-1-2: Event triggered report when Transport Channel Traffic Volume becomes smaller than certain threshold**

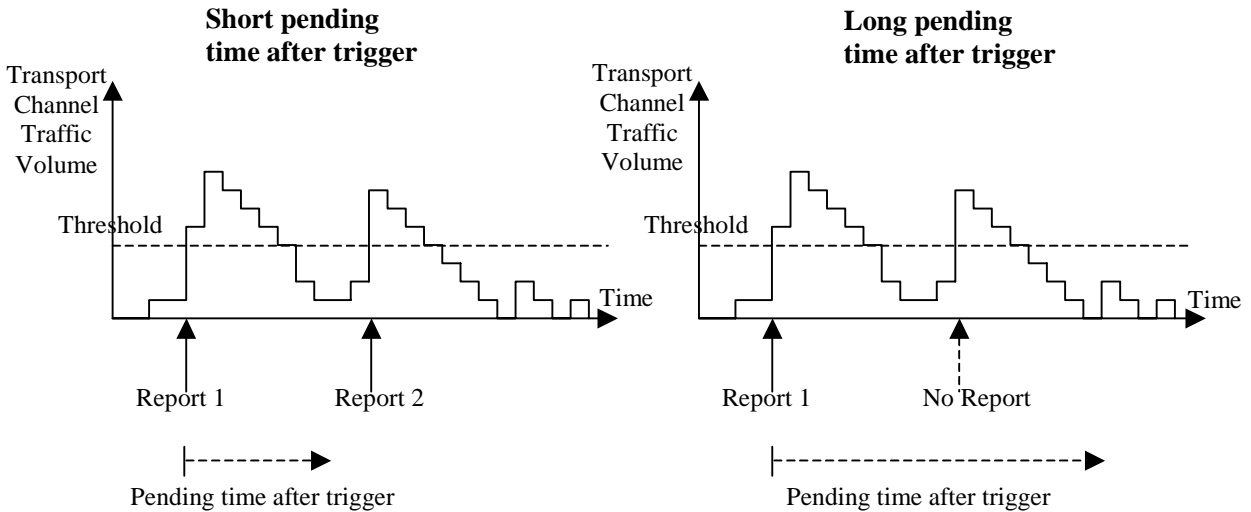
If the monitored Transport Channel Traffic Volume [15] becomes smaller than an absolute threshold, i.e. if  $TCTVF < \text{Reporting threshold}$ , this is an event that could trigger a report. The corresponding report specifies at least which measurement ID the event that triggered the report belongs to.

### 14.4.3 Traffic volume reporting mechanisms

Traffic volume measurement triggering could be associated with both a *time-to-trigger* and a *pending time after trigger*. The time-to-trigger is used to get time domain hysteresis, i.e. the condition must be fulfilled during the time-to-trigger time before a report is sent. Pending time after trigger is used to limit consecutive reports when one traffic volume measurement report already has been sent. This is described in detail below.

#### 14.4.3.1 Pending time after trigger

This timer is started in the UE when a measurement report has been triggered by a given event. The UE is then forbidden to send any new measurement reports with the same measurement ID triggered by the same event during this time period even when the triggering condition is fulfilled again. Instead the UE waits until the timer has suspended expired. If the Transport Channel Traffic Volume [15] is still above the threshold for event 4a, or below the threshold for event 4b when the timer has expired, the UE sends a new measurement report, and the timer is restarted. Otherwise it waits for a new triggering.

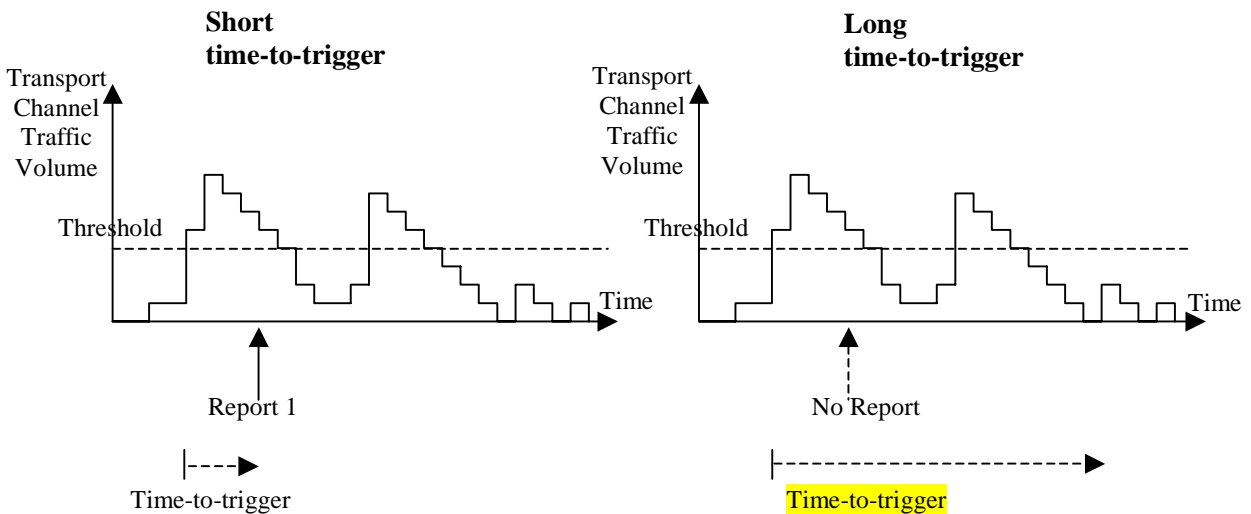


**Figure 14.4.3.1-1: Pending time after trigger limits the amount of consecutive measurement reports**

Figure 14.4.3.1-1 shows that by increasing the pending time after trigger a triggered second event does not result in a measurement report.

### 14.4.3.x Time-to-trigger

The timer is started in the UE when the Transport Channel Traffic Volume triggers the event. If the TCTV does not cross the threshold before the timer expires, a report the timer is stopped. If the timer expires then a report is triggered.



**Figure 14.4.3.1-2: Time-to-trigger is used to achieve time hysteresis**

Figure 14.4.3.1-2 shows that by increasing the time-to-trigger the report is not triggered.

## 14.4.4 Interruption of user data transmission

By including the IE “Tx Interruption after trigger”, a UE in CELL\_FACH substate may be instructed by the UTRAN to cease temporarily prohibit transmission of user data on the RACH after a measurement report has been triggered. Before The UE shall only resuming the transmission of user data, when:

- 1> ~~the UE shall~~ it receives from the UTRAN either a message allocating a dedicated physical channel, and ~~make~~ leading to the transition to CELL\_DCH state; or
- 1> ~~the UE shall~~ the time period indicated by the IE “Tx Interruption after trigger” elapses, receive an individually assigned measurement control message indicating that interruption of user data transmission is not be applied.

The transmission of signalling messages on the signalling radio bearers shall not be interrupted.



## CHANGE REQUEST

⌘ **25.331 CR 1485** ⌘ rev **1** ⌘ Current version: **4.4.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Traffic Volume Measurement correction		
<b>Source:</b>	⌘ Qualcomm, Ericsson, Sasken		
<b>Work item code:</b>	⌘	<b>Date:</b>	⌘ 22.01.2002
<b>Category:</b>	⌘ <b>A</b>	<b>Release:</b>	⌘ REL-4
	<i>Use <u>one</u> of the following categories:</i> <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900.		<i>Use <u>one</u> of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

**Reason for change:** ⌘ The current description is unclear and does not match the group's understanding of how it should work.

- Summary of change:** ⌘
- Clarified the distinction between the set of transport channels the UE is supposed to report on and the set of transport channels it is supposed to trigger on. The two sets can be completely disjoint.
  - Clarified the cases in which the configuration should be rejected.
  - Aligned the name of one Multiplicity value with what is in the Tabular.
  - Moved the text dealing with the generation of reports to section 14 (to align with other measurements).
  - Clarified that the Pending-time-after trigger applied per event rather than per measurement ID (to align with the signalling).
  - Corrected the Interruption of user data transmission to align it with the understanding of the group.
  - Clarified what the UE should report on when an RB is mapped onto two logical channels (as per the agreement in the previous meeting).
  - Specified that when the set of TrCHs on which an event trigger is defined is not provided explicitly, the UE shall apply it on the TrCHs specified by the measurement object.
  - Specified when the Pending-time-after-trigger timer needed to be started.
  - Corrected some of the interactions between the time-to-trigger and Pending-time-after-trigger mechanisms.
  - Clarified that at most one Time-to-trigger and Pending-time-after-trigger was needed for each configured event.

		<ul style="list-style-type: none"> <li>- Aligned the name of the event 4a with its behavior.</li> <li>- Corrected a number of editorial errors.</li> </ul>
<b>Consequences if not approved:</b>	⌘	Unclear and inconsistent specifications rendering correct TVM configuration and thus RRM operation impossible.
<b>Clauses affected:</b>	⌘	8.6.7.10, 8.6.7.11, 10.3.10, 14.4.1, 14.4.2, 14.4.2.1, 14.4.2.2, 14.4.3.1, 14.4.3.x(new) , 14.4.4
<b>Other specs affected:</b>	⌘	<input type="checkbox"/> Other core specifications      ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘	

**How to create CRs using this form:**

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.htm). Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

### 8.6.7.10 Traffic Volume Measurement

If the IE "Traffic Volume Measurement" is received by the UE, the UE shall:

- 1> store the content of the IE to the variable MEASUREMENT\_IDENTITY.

~~If the IE "Traffic volume measurement Object" is not included, the UE shall:~~

- ~~1> apply the measurement reporting criteria to all uplink transport channels.~~

If IE "Traffic volume measurement" is received by the UE in a MEASUREMENT CONTROL message, where IE "measurement command" has the value "setup", and if the IE "traffic volume reporting quantity" is included, the UE shall:

- ~~1> report the measured quantities specified in the IE "traffic volume reporting quantity";~~

- 1> if the parameter "Average of RLC Buffer Payload for each RB" or the parameter "Variance of RLC Buffer payload for each RB" is set to "TRUE":

- 2> if the IE "Traffic volume measurement quantity" is not included:

- 3> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

- 2> if the IE "Traffic volume measurement quantity" is included;

- ~~3> if the parameter "time interval to take an average or a variance" is included:~~

- ~~4> use the time specified in the parameter "time interval to take an average or a variance" to calculate the average and/or variance of RLC Buffer Payload according to the IE "traffic volume reporting quantity".~~

- 3> if the parameter "time interval to take an average or a variance" is not included:

- 4> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

If IE "Traffic volume measurement" is received by the UE in a MEASUREMENT CONTROL message, where IE "measurement command" has the value "setup", but IE "Traffic volume ~~measurement reporting~~ quantity" ~~or IE "Traffic volume reporting quantity"~~ is not received, the UE shall:

- ~~1> clear all stored measurement control information related associated to this measurement identity in variable MEASUREMENT\_IDENTITY;~~

- 1> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

### 8.6.7.11 Traffic Volume Measurement Reporting Criteria

If the IE "Traffic Volume Measurement Reporting Criteria" is received by the UE, the UE shall:

- 1> if the IE "Parameters sent for each transport channel" is absent:

- 2> set the variable PROTOCOL\_ERROR\_REJECT to TRUE;

- 2> set the IE "Protocol error cause" in the variable PROTOCOL\_ERROR\_INFORMATION to "Information element missing".

- 1> for each IE "Parameters sent for each transport channel":

- 2> if the IE "Parameters required for each Event" is absent:

- 3> set the variable CONFIGURATION\_INCOMPLETE to TRUE;

- ~~1> store the content of the IE "Traffic Volume Measurement Reporting Criteria" to the variable MEASUREMENT\_IDENTITY.~~

~~If the IE "UL transport channel id" is not included, the UE shall:~~

- 1> ~~apply the measurement reporting criteria to all uplink transport channels indicated in the IE "Traffic volume measurement object";~~
- 1> ~~if the UTRAN has not specified a traffic volume measurement object for a given measurement identity:~~
- 2> ~~apply the measurement reporting criteria to all uplink transport channels that are configured for the current UE state.~~

If the IE "Tx interruption after trigger" is included, the UE shall:

- 1> ~~block DTCH transmissions on the RACH during the time specified in the IE after a measurement report is transmitted.~~

### 10.3.7.71 Traffic volume measurement quantity

Contains the measurement quantity information for a traffic volume measurement.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Measurement quantity	MP		Enumerated( RLC buffer payload, Average RLC buffer payload, Variance of RLC buffer payload)	<del>The use of this parameter is described in subclause 8.6.7.10. This parameter should be ignored.</del>
Time Interval to take an average or a variance	CV-A/V		Integer(20, 40, ..260, by steps of 20)	In ms

Condition	Explanation
A/V	This IE is mandatory present when "Average RLC buffer" or "Variance of RLC buffer payload" is chosen and not needed otherwise.

### 10.3.7.72 Traffic volume measurement reporting criteria

Contains the measurement reporting criteria information for a traffic volume measurement.

Event 4a: Transport Channel Traffic Volume [15] exceeds an absolute threshold.

Event 4b: Transport Channel Traffic Volume [15] becomes smaller than an absolute threshold.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Parameters sent for each transport channel	OP	1 to <maxTrCH >		This IE is always required, need is OP to align with ASN.1
>Uplink transport channel type	OP		Enumerated(DCH,RACHorCPCH,USCH)	USCH is TDD only. CPCH is FDD only. RACHorCPCH is the currently configured default in the uplink.
>UL Transport Channel ID	CV-UL-DCH/USCH		Transport channel identity 10.3.5.18	
>Parameters required for each Event	OP	1 to <maxMeaspaerEvent >		
>>Traffic volume event identity	MP		Traffic volume event identity 10.3.7.66	
>>Reporting Threshold	MP		Enumerated(8,16,32,64,128,256,512,1024,2K,3K,4K,6K,8K,12K,16K,24K,32K,48K,64K,96K,128K,192K,256K,384K,512K,768K)	Threshold in bytes And N Kbytes = N*1024 bytes
>>Time to trigger	OP		Time to trigger 10.3.7.64	Indicates the period of time between the timing of event detection and the timing of sending Measurement Report. Time in ms
>>Pending time after trigger	OP		Integer(250, 500, 1000, 2000, 4000, 8000, 16000)	Indicates the period of time during which it is forbidden to send any new measurement reports with the same Traffic volume event identity even if the triggering condition is fulfilled. Time in milliseconds
>>Tx interruption after trigger	OP		Integer (250, 500, 1000, 2000, 4000, 8000, 16000)	Time in milliseconds. Indicates how long the UE shall block DTCH transmissions on the RACH after a measurement report is triggered.

Condition	Explanation
UL-DCH/USCH	If IE "Uplink transport channel type" is equal to "DCH" or "USCH" (TDD only) this IE is optional. Otherwise the IE is not needed.

### 10.3.10 Multiplicity values and type constraint values

The following table includes constants that are either used as multi bounds (name starting with "max") or as high or low value in a type specification (name starting with "lo" or "hi"). Constants are specified only for values appearing more than once in the RRC specification. In case a constant is related to one or more other constants, an expression is included in the "value" column instead of the actual value.

Constant	Explanation	Value
<b>CN information</b>		
maxCNdomains	Maximum number of CN domains	4
<b>UTRAN mobility information</b>		
maxRAT	Maximum number of Radio Access Technologies	maxOtherRAT + 1
maxOtherRAT	Maximum number of other Radio Access Technologies	15
maxURA	Maximum number of URAs in a cell	8
maxInterSysMessages	Maximum number of Inter System Messages	4
maxRABsetup	Maximum number of RABs to be established	16
<b>UE information</b>		
maxtransactions	Maximum number of parallel RRC transactions in downlink	25
maxPDCPalgoType	Maximum number of PDCP algorithm types	8
maxDRACclasses	Maximum number of UE classes which would require different DRAC parameters	8
MaxFreqBandsFDD	Maximum number of frequency bands supported by the UE as defined in [21]	8
MaxFreqBandsTDD	Maximum number of frequency bands supported by the UE as defined in [22]	4
MaxFreqBandsGSM	Maximum number of frequency bands supported by the UE as defined in [45]	16
maxPage1	Number of UEs paged in the Paging Type 1 message	8
MaxSystemCapability	Maximum number of system specific capabilities that can be requested in one message.	16
<b>RB information</b>		
MaxPredefConfig	Maximum number of predefined configurations	16
MaxRB	Maximum number of RBs	32
MaxSRBsetup	Maximum number of signalling RBs to be established	8
MaxRBperRAB	Maximum number of RBs per RAB	8
MaxRBallRABs	Maximum number of non signalling RBs	27
MaxRBMuxOptions	Maximum number of RB multiplexing options	8
MaxLoCHperRLC	Maximum number of logical channels per RLC entity	2
<b>TrCH information</b>		
MaxTrCH	Maximum number of transport channels used in one direction (UL or DL)	32
MaxTrCHpreconf	Maximum number of preconfigured Transport channels, per direction	16
MaxCCTrCH	Maximum number of CCTrCHs	8
MaxTF	Maximum number of different transport formats that can be included in the Transport format set for one transport channel	32
maxTF-CPCH	Maximum number of TFs in a CPCH set	16
MaxTFC	Maximum number of Transport Format Combinations	1024
maxTFCI-1-Combs	Maximum number of TFCI (field 1) combinations	512
maxTFCI-2-Combs	Maximum number of TFCI (field 2) combinations	512
maxCPCHsets	Maximum number of CPCH sets per cell	16
maxSIBperMsg	Maximum number of complete system information blocks per SYSTEM INFORMATION message	16
maxSIB	Maximum number of references to other system information blocks.	32
maxSIB-FACH	Maximum number of references to system information blocks on the FACH	8
<b>PhyCH information</b>		
maxPCPCH-APsubCH	Maximum number of available sub-channels for AP signature on PCPCH	12
maxPCPCH-CDsubCH	Maximum number of available sub-channels for CD signature on PCPCH	12
maxPCPCH-APsig	Maximum number of available signatures for AP on PCPCH	16

Constant	Explanation	Value
maxPCPCH-CDsig	Maximum number of available signatures for CD on PCPCH	16
maxAC	Maximum number of access classes	16
maxASC	Maximum number of access service classes	8
maxASCmap	Maximum number of access class to access service classes mappings	7
maxASCpersist	Maximum number of access service classes for which persistence scaling factors are specified	6
maxPRACH	Maximum number of PRACHs in a cell	16
maxFACHPCH	Maximum number of FACHs and PCHs mapped onto one secondary CCPCHs	8
maxRL	Maximum number of radio links	8
maxSCCPCH	Maximum number of secondary CCPCHs per cell	16
maxDPDCH-UL	Maximum number of DPDCHs per cell	6
maxDPCH-DLchan	Maximum number of channelisation codes used for DL DPCH	8
maxPUSCH	Maximum number of PUSCHs	(8)
maxPDSCH	Maximum number of PDSCHs	8
maxPDSCHcodes	Maximum number of codes for PDSCH	16
maxPDSCH-TFCIgroups	Maximum number of TFCI groups for PDSCH	256
maxPDSCHcodeGroups	Maximum number of code groups for PDSCH	256
maxPCPCHs	Maximum number of PCPCH channels in a CPCH Set	64
maxPCPCH-SF	Maximum number of available SFs on PCPCH	7
maxTS	Maximum number of timeslots used in one direction (UL or DL)	14
hiPUSCHidentities	Maximum number of PUSCH Identities	64
hiPDSCHidentities	Maximum number of PDSCH Identities	64
<b>Measurement information</b>		
maxTGPS	Maximum number of transmission gap pattern sequences	6
maxAdditionalMeas	Maximum number of additional measurements for a given measurement identity	4
maxMeasEvent	Maximum number of events that can be listed in measurement reporting criteria	8
MaxMeasParEvent	Maximum number of measurement parameters (e.g. thresholds) per event	2
maxMeasIntervals	Maximum number of intervals that define the mapping function between the measurements for the cell quality Q of a cell and the representing quality value	1
maxCellMeas	Maximum number of cells to measure	32
maxReportedGSMCells	Maximum number of GSM cells to be reported	6
maxFreq	Maximum number of frequencies to measure	8
maxSat	Maximum number of satellites to measure	16
HiRM	Maximum number that could be set as rate matching attribute for a transport channel	256
<b>Frequency information</b>		
maxFDDFreqList	Maximum number of FDD carrier frequencies to be stored in USIM	4
maxTDDFreqList	Maximum number of TDD carrier frequencies to be stored in USIM	4
maxFDDFreqCellList	Maximum number of neighbouring FDD cells to be stored in USIM	32
maxTDDFreqCellList	Maximum number of neighbouring TDD cells to be stored in USIM	32
maxGSMCellList	Maximum number of GSM cells to be stored in USIM	32
<b>Other information</b>		
maxNumGSMFreqRanges	Maximum number of GSM Frequency Ranges to store	32
maxNumFDDFreqs	Maximum number of FDD centre frequencies to store	8
maxNumTDDFreqs	Maximum number of TDD centre frequencies to store	8
maxNumCDMA200Freqs	Maximum number of CDMA2000 centre frequencies to store	8

## 14.4 Traffic Volume Measurements

### 14.4.1 Traffic Volume Measurement Quantity

Traffic volume measurements may be configured by RRC to assist with dynamic radio bearer control. The reported quantities that can be configured are:

- 1 Buffer Occupancy.
- 2 Average of Buffer Occupancy.
- 3 Variance of Buffer Occupancy.

A description of these values can be found in [15].

When a report is triggered, the UE shall provide the requested quantities for the acknowledged and unacknowledged mode RBs mapped onto the transport channels identified.

~~In order to support a large variation of bit rates and RLC buffer size capabilities, a non-linear scale is used. Since, for each RB, the expected traffic includes both new and retransmitted RLC PDUs and potentially existing Control PDUs, all these should be included in the Buffer Occupancy measure. It should also be noted that traffic volume measurements are only applicable for acknowledged and unacknowledged mode.~~

~~According to what is stated in the Measurement Control message, the UE should support reporting of RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload for RBs multiplexed onto the same Transport channel. The Reporting Quantities (i.e. RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload of each RB) are indicated in the measurement control message. If Average of RLC Buffer Payload or Variance of RLC Buffer Payload is included as Reporting Quantity, the time interval to take an average or a variance shall be used. When the RLC buffer payload, Average of RLC buffer payload or Variance of RLC buffer payload is reported, the measured quantity shall be rounded upwards to the closest higher value possible to report.~~

### 14.4.2 Traffic Volume reporting triggers

~~Traffic volume measurement reports can be reported-triggered using~~ in two different ways/mechanisms, periodical and event triggered. The reporting criteria are specified in the measurement control message.

~~For periodical reporting the UE simply determines the Reporting Quantities in number of bytes for each RB mapped onto the indicated transport channels and reports the results at the time interval and for the number of times specified.~~

All the specified events are evaluated with respect to the Transport Channel Traffic Volume (TCTV). This quantity is equal to the sum of the Buffer Occupancy for all logical channels mapped onto a transport channel. The events on a given transport channel shall be evaluated at least at every TTI (may be more often) as described in [15].

~~For traffic volume measurements in the UE only one quantity is compared with the thresholds. This quantity is Transport Channel Traffic Volume [15] (which equals the sum of Buffer Occupancies of RBs multiplexed onto a transport channel) in number of bytes. Event triggered reporting is performed when the Transport Channel Traffic Volume exceeds an upper threshold or becomes smaller than a lower threshold. Every TTI, UE measures the Transport Channel Traffic Volume for each transport channel and compares it with the configured thresholds. If the value is out of range, the UE determines the Reporting Quantities for the RBs mapped onto that transport channel and reports the results.~~

When a traffic volume measurement is set up, the UE shall:

- 1> if the IE "report criteria" is set to "Traffic volume measurement reporting criteria", the UE shall:
  - 2> for each IE "Parameters sent for each transport channel":
    - 3> if the IE "Uplink transport channel type" is not included; or
    - 3> if the IE "Uplink Transport Channel Type" has the value "DCH" or "USCH" and the IE "UL transport channel id" is not included, the UE shall:
      - 4> for each IE "Parameters required for each Event":



5> for each ~~configured~~ uplink transport channel on which the UE is supposed to report (see below), configure an event trigger defined by the values in the IEs “Measurement Identity”, “Traffic volume event identity”, “Reporting threshold”, “Time to trigger”, “Pending time after trigger” and “Tx Interruption after trigger”;

3> else:

4> for each IE “Parameters required for each Event”:

5> for the uplink transport channel defined by the IEs “Uplink transport channel type” and “UL transport channel id”, configure an event trigger defined by the values in the IEs “Measurement Identity”, “Traffic volume event identity”, “Reporting threshold”, “Time to trigger”, “Pending time after trigger” and “Tx Interruption after trigger”;

1> else if the IE “report criteria” is set to “Periodical reporting criteria”:

2> configure periodical triggers with period equal to the value in the IE “Reporting Interval” and with number of transmissions equal to the value in the IE “Amount of reporting” for the measurement identified by the IE “Measurement Identity”;

For each transport channel for which an event trigger has been configured, the UE shall:

1> for each event configured for this transport channel:

2> if the transport channel TCTV becomes larger than the threshold in IE “Reporting threshold”:

3> if the IE “Traffic volume event identity” has value “4a”:

4> if the IE “Time to trigger” is not present; and:

54> if there is no active Pending-time-after-trigger timer for this event is not active.;

5> if the IE “Pending time after trigger” is included, start the Pending-time-after-trigger timer for this event with the value in this IE;

5> trigger a report for the measurement identified by the IE “Measurement Identity”.

4> else:

5> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

3> else (if the IE “Traffic volume event identity” has value “4b”):

4> if the Time-to-trigger timer for this event is active:

5> stop this timer.

2> if the transport channel TCTV becomes smaller than the threshold in IE “Reporting threshold”:

3> if the IE “Traffic volume event identity” has value “4a”:

4> if the Time-to-trigger timer for this event is active:

5> stop this timer.

3> else (if the IE “Traffic volume event identity” has value “4b”):

4> if the IE “Time to trigger” is not present; and:

54> if there is no active Pending-time-after-trigger timer for this event is not active.;

5> if the IE “Pending time after trigger” is included, start the Pending-time-after-trigger timer for this event with the value in this IE;

5> trigger a report for the measurement identified by the IE “Measurement Identity”.

4> else:

5> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

When the Time-to-trigger timer for an event elapses:

1> if the Pending-time-after-trigger timer for this event is not active:

42> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

2> if the IE “Pending time after trigger” is included:

3> start the Pending-time-after-trigger timer for this event with the value in this IE;

When the Pending-time-after-trigger for an event elapses:

1> if the IE “Traffic volume event identity” has value “4a”:

2> if the transport channel TCTV is larger than the threshold in IE “Reporting threshold”:

3> if the IE “Time to trigger” is not present:

4> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

4> start the Pending-time-after-trigger timer for this event with the value in the IE “Pending time after trigger”.

3> else:

4> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

1> if the IE “Traffic volume event identity” has value “4b”:

2> if the transport channel TCTV is smaller than the threshold in IE “Reporting threshold”:

3> if the IE “Time to trigger” is not present:

4> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

4> start the Pending-time-after-trigger timer for this event with the value in the IE “Pending time after trigger”.

3> else:

4> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

When a periodical trigger elapses, the UE shall:

1> trigger a report for the measurement identified by the IE “Measurement Identity”;

1> if the number of reports triggered by this periodical trigger reaches the value in the IE “Amount of reporting”:

2> disable this periodical trigger.

When a report is triggered for a given IE “Measurement Identity”, the UE shall:

1> consider the variable MEASUREMENT\_IDENTITY corresponding to this measurement identity;

1> if the report is triggered by an event trigger:

2> include the IE “Event results”;

2> set the IE “Uplink transport channel type causing the event” to the type of the transport channel which triggered the report;

2> if the transport channel type is “DCH” or “USCH”:

- 3> include the IE “UL Transport Channel identity” and set it to the identity of the transport channel which triggered the report;
- 2> else:
  - 3> do not include the IE “UL Transport Channel identity”;
  - 2> set the IE “Traffic volume event identity” to the identity of the event that triggered the report;
  - 2> if the IE “Tx interruption after trigger” for the event that triggered the report is included:
    - 3> if the UE is in CELL\_FACH state:
      - 4> prohibit DTCH transmissions on the RACH;
      - 4> resume these transmissions when:
        - 5> it receives from the UTRAN a message causing the transition to CELL\_DCH state; or
        - 5> the time period indicated in the IE “Tx interruption after trigger” elapses;
- 1> if the IE “Traffic volume measurement object” is not included, the UE shall:
  - 2> report on all the uplink transport channels as specified below;
- 1> if the IE “Traffic volume measurement object” is included, the UE shall:
  - 2> report on the uplink transport channels identified in this IE as specified below;
- 1> for each UM or AM RB mapped onto a transport channel on which the UE is expected to report, the UE shall:
  - 2> add an element in the IE “Traffic volume measurement results”;
  - 2> set the value of the IE “RB Identity” to the identity of the considered radio bearer;
  - 2> if the RB is mapped onto one logical channel:
    - 3> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “RLC Buffers Payload” and set it to the Buffer Occupancy value for this logical channel, rounded up to the next allowed value;
    - 3> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “Average of RLC Buffer Payload” and set it to the Buffer Occupancy for this logical channel averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
    - 3> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the Buffer Occupancy for this logical channel computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
  - 2> if the RB is mapped onto two logical channels:
    - 3> if one logical channel is mapped onto transport channels on which the UE is supposed to report:
      - 4> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
        - 5> include the IE “RLC Buffers Payload” and set it to the Buffer Occupancy value for this logical channel, rounded up to the next allowed value;
      - 4> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
        - 5> include the IE “Average of RLC Buffer Payload” and set it to the Buffer Occupancy for this logical channel averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;

4> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:

5> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the Buffer Occupancy for this logical channel computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;

3> else (if both logical channels are mapped onto transport channels on which the UE is supposed to report):

4> if the IE “RLC Buffer Payload for each RB” is set to TRUE:

5> include the IE “RLC Buffers Payload” and set it to the sum of the Buffer Occupancy values for the two logical channels, rounded up to the next allowed value;

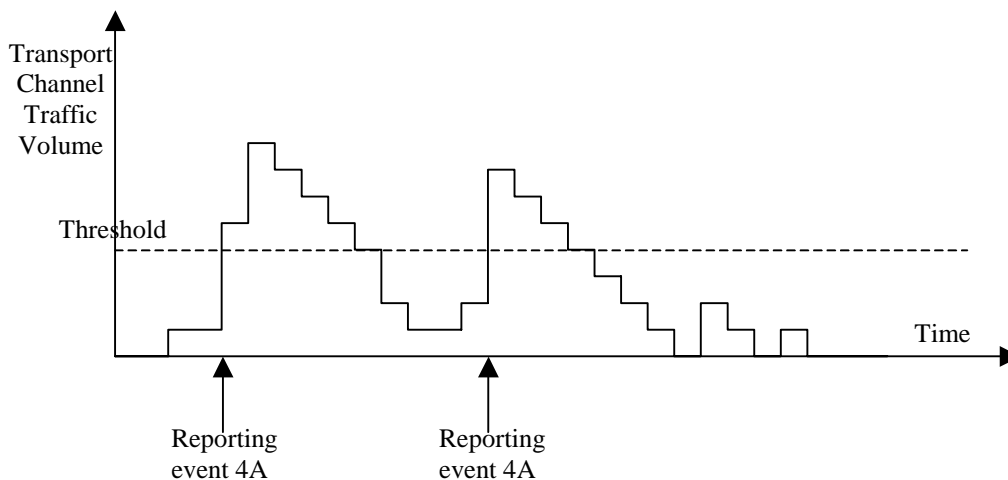
4> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:

5> include the IE “Average of RLC Buffer Payload” and set it to the sum of the Buffer Occupancy for the two logical channels averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]) and rounded up to the next allowed value;

4> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:

5> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the sum of the Buffer Occupancy for the two logical channels, computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]) and rounded up to the next allowed value;

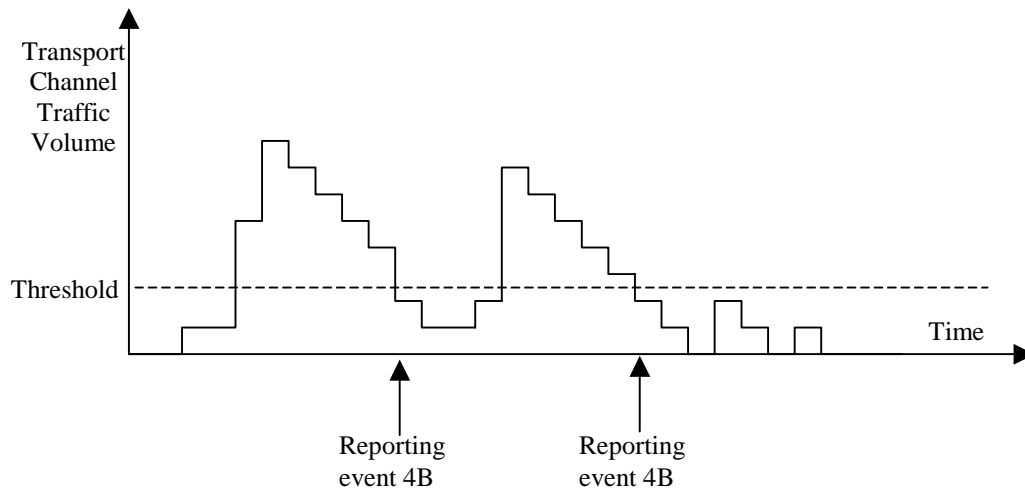
#### 14.4.2.1 Reporting event 4 A: Transport Channel Traffic Volume ~~exceeds~~ becomes larger than an absolute threshold



**Figure 14.4.2.1-1: Event triggered report when Transport Channel Traffic Volume ~~exceeds~~ becomes larger than a certain threshold**

If the monitored Transport Channel Traffic Volume [15] ~~exceeds~~ becomes larger than an absolute threshold, i.e. if  $TCTVF > \text{Reporting threshold}$ , this is an event that could trigger a report. The corresponding report specifies at least which measurement ID the event that triggered the report belongs to.

#### 14.4.2.2 Reporting event 4 B: Transport Channel Traffic Volume becomes smaller than an absolute threshold



**Figure 14.4.2-1-2: Event triggered report when Transport Channel Traffic Volume becomes smaller than certain threshold**

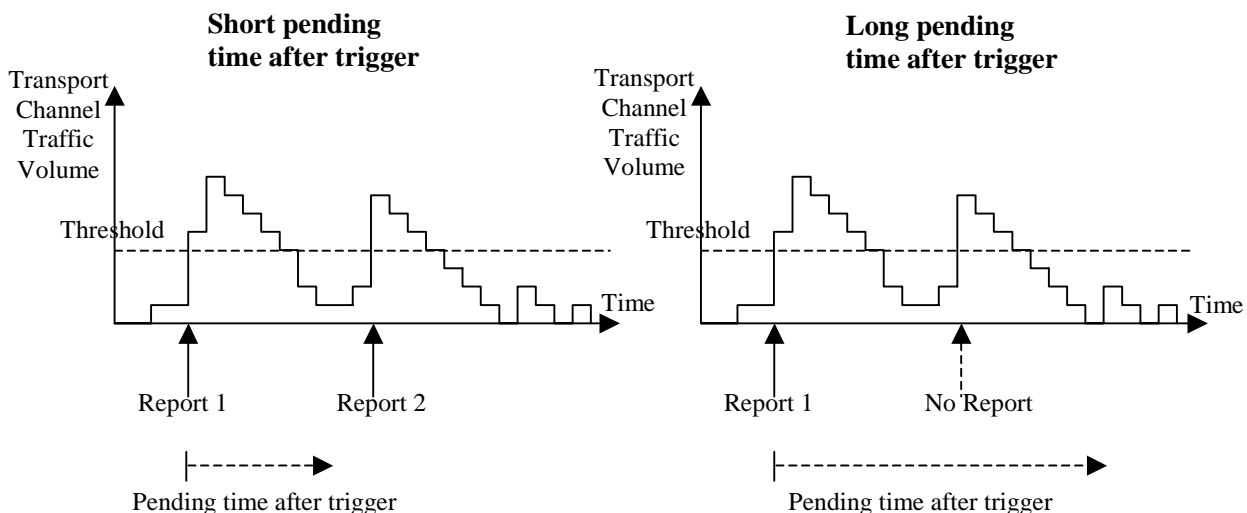
If the monitored Transport Channel Traffic Volume [15] becomes smaller than an absolute threshold, i.e. if  $TCTVF < \text{Reporting threshold}$ , this is an event that could trigger a report. The corresponding report specifies at least which measurement ID the event that triggered the report belongs to.

### 14.4.3 Traffic volume reporting mechanisms

Traffic volume measurement triggering could be associated with both a *time-to-trigger* and a *pending time after trigger*. The time-to-trigger is used to get time domain hysteresis, i.e. the condition must be fulfilled during the time-to-trigger time before a report is sent. Pending time after trigger is used to limit consecutive reports when one traffic volume measurement report already has been sent. This is described in detail below.

#### 14.4.3.1 Pending time after trigger

This timer is started in the UE when a measurement report has been triggered by a given event. The UE is then forbidden to send any new measurement reports with the same measurement ID triggered by the same event during this time period even when the triggering condition is fulfilled again. Instead the UE waits until the timer has suspended expired. If the Transport Channel Traffic Volume [15] is still above the threshold for event 4a, or below the threshold for event 4b when the timer has expired, the UE sends a new measurement report, and the timer is restarted. Otherwise it waits for a new triggering.

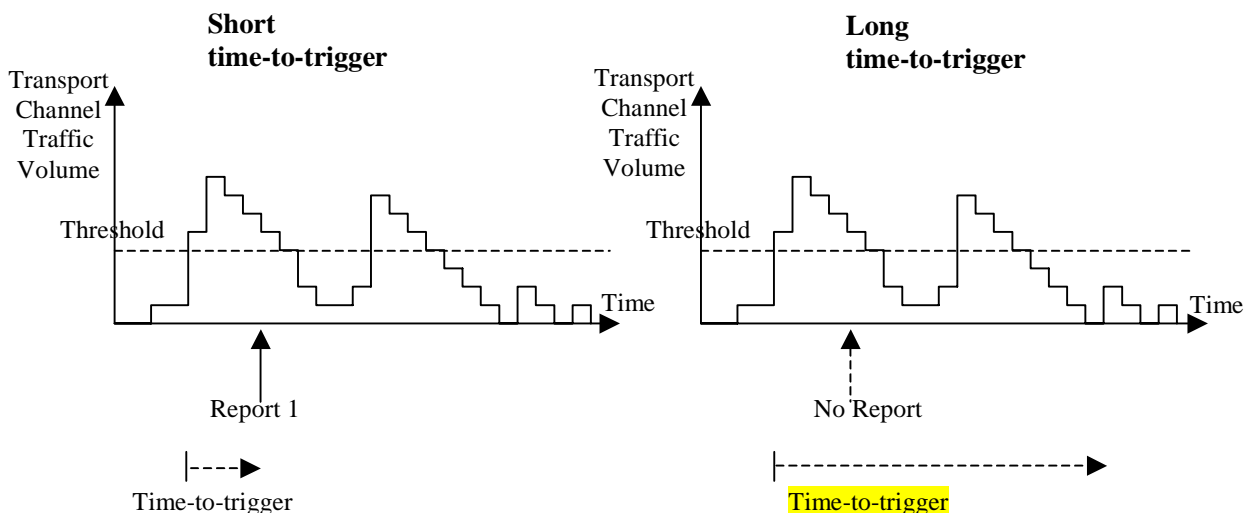


**Figure 14.4.3.1-1: Pending time after trigger limits the amount of consecutive measurement reports**

Figure 14.4.3.1-1 shows that by increasing the pending time after trigger a triggered second event does not result in a measurement report.

### 14.4.3.x Time-to-trigger

The timer is started in the UE when the Transport Channel Traffic Volume triggers the event. If the TCTV does not cross the threshold before the timer expires, ~~a report~~ the timer is stopped. If the timer expires then a report is triggered.



**Figure 14.4.3.1-2: Time-to-trigger is used to achieve time hysteresis**

Figure 14.4.3.1-2 shows that by increasing the time-to-trigger the report is not triggered.

## 14.4.4 Interruption of user data transmission

By including the IE “Tx Interruption after trigger”, a UE in CELL\_FACH substate may be instructed by the UTRAN to ~~ease temporarily prohibit~~ temporarily prohibit transmission of user data on the RACH after a measurement report has been triggered. ~~Before~~ The UE shall only resume the transmission of user data, when:

- 1> ~~the UE shall~~ it receives from the UTRAN either a message allocating a dedicated physical channel, and ~~make~~ leading to the transition to CELL\_DCH state; or
- 1> ~~the UE shall~~ the time period indicated by the IE “Tx Interruption after trigger” elapses, ~~receive an individually assigned measurement control message indicating that interruption of user data transmission is not be applied.~~

The transmission of signalling messages on the signalling radio bearers shall not be interrupted.

## CHANGE REQUEST

⌘ **25.331 CR 1486** ⌘ rev **1** ⌘ Current version: **5.0.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Traffic Volume Measurement correction		
<b>Source:</b>	⌘ Qualcomm, Ericsson, Sasken		
<b>Work item code:</b>	⌘	<b>Date:</b>	⌘ 22.01.2002
<b>Category:</b>	⌘ <b>A</b>	<b>Release:</b>	⌘ REL-5
	<i>Use <u>one</u> of the following categories:</i> <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900.		<i>Use <u>one</u> of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

**Reason for change:** ⌘ The current description is unclear and does not match the group's understanding of how it should work.

**Summary of change:** ⌘

- Clarified the distinction between the set of transport channels the UE is supposed to report on and the set of transport channels it is supposed to trigger on. The two sets can be completely disjoint.
- Clarified the cases in which the configuration should be rejected.
- Aligned the name of one Multiplicity value with what is in the Tabular.
- Moved the text dealing with the generation of reports to section 14 (to align with other measurements).
- Clarified that the Pending-time-after trigger applied per event rather than per measurement ID (to align with the signalling).
- Corrected the Interruption of user data transmission to align it with the understanding of the group.
- Clarified what the UE should report on when an RB is mapped onto two logical channels (as per the agreement in the previous meeting).
- Specified that when the set of TrCHs on which an event trigger is defined is not provided explicitly, the UE shall apply it on the TrCHs specified by the measurement object.
- Specified when the Pending-time-after-trigger timer needed to be started.
- Corrected some of the interactions between the time-to-trigger and Pending-time-after-trigger mechanisms.
- Clarified that at most one Time-to-trigger and Pending-time-after-trigger was needed for each configured event.



		<ul style="list-style-type: none"> <li>- Aligned the name of the event 4a with its behavior.</li> <li>- Corrected a number of editorial errors.</li> </ul>
<b>Consequences if not approved:</b>	⌘	Unclear and inconsistent specifications rendering correct TVM configuration and thus RRM operation impossible.
<b>Clauses affected:</b>	⌘	8.6.7.10, 8.6.7.11, 10.3.10, 14.4.1, 14.4.2, 14.4.2.1, 14.4.2.2, 14.4.3.1, 14.4.3.x(new) , 14.4.4
<b>Other specs affected:</b>	⌘	<input type="checkbox"/> Other core specifications      ⌘ <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘	

**How to create CRs using this form:**

Comprehensive information and tips about how to create CRs can be found at: [http://www.3gpp.org/3G\\_Specs/CRs.htm](http://www.3gpp.org/3G_Specs/CRs.htm). Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

### 8.6.7.10 Traffic Volume Measurement

If the IE "Traffic Volume Measurement" is received by the UE, the UE shall:

- 1> store the content of the IE to the variable MEASUREMENT\_IDENTITY.

~~If the IE "Traffic volume measurement Object" is not included, the UE shall:~~

- ~~1> apply the measurement reporting criteria to all uplink transport channels.~~

If IE "Traffic volume measurement" is received by the UE in a MEASUREMENT CONTROL message, where IE "measurement command" has the value "setup", and if the IE "traffic volume reporting quantity" is included, the UE shall:

- ~~1> report the measured quantities specified in the IE "traffic volume reporting quantity";~~

- 1> if the parameter "Average of RLC Buffer Payload for each RB" or the parameter "Variance of RLC Buffer payload for each RB" is set to "TRUE":

- 2> if the IE "Traffic volume measurement quantity" is not included:

- 3> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

- 2> if the IE "Traffic volume measurement quantity" is included;

- ~~3> if the parameter "time interval to take an average or a variance" is included:~~

- ~~4> use the time specified in the parameter "time interval to take an average or a variance" to calculate the average and/or variance of RLC Buffer Payload according to the IE "traffic volume reporting quantity".~~

- 3> if the parameter "time interval to take an average or a variance" is not included:

- 4> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

If IE "Traffic volume measurement" is received by the UE in a MEASUREMENT CONTROL message, where IE "measurement command" has the value "setup", but IE "Traffic volume ~~measurement reporting~~ quantity" ~~or IE "Traffic volume reporting quantity"~~ is not received, the UE shall:

- ~~1> clear all stored measurement control information related associated to this measurement identity in variable MEASUREMENT\_IDENTITY;~~

- 1> set the variable CONFIGURATION\_INCOMPLETE to TRUE.

### 8.6.7.11 Traffic Volume Measurement Reporting Criteria

If the IE "Traffic Volume Measurement Reporting Criteria" is received by the UE, the UE shall:

- 1> if the IE "Parameters sent for each transport channel" is absent:

- 2> set the variable PROTOCOL\_ERROR\_REJECT to TRUE;

- 2> set the IE "Protocol error cause" in the variable PROTOCOL\_ERROR\_INFORMATION to "Information element missing".

- 1> for each IE "Parameters sent for each transport channel":

- 2> if the IE "Parameters required for each Event" is absent:

- 3> set the variable CONFIGURATION\_INCOMPLETE to TRUE;

- ~~1> store the content of the IE "Traffic Volume Measurement Reporting Criteria" to the variable MEASUREMENT\_IDENTITY.~~

~~If the IE "UL transport channel id" is not included, the UE shall:~~

- 1> ~~apply the measurement reporting criteria to all uplink transport channels indicated in the IE "Traffic volume measurement object";~~
- 1> ~~if the UTRAN has not specified a traffic volume measurement object for a given measurement identity:~~
- 2> ~~apply the measurement reporting criteria to all uplink transport channels that are configured for the current UE state.~~

If the IE "Tx interruption after trigger" is included, the UE shall:

- 1> ~~block DTCH transmissions on the RACH during the time specified in the IE after a measurement report is transmitted.~~

### 10.3.7.71 Traffic volume measurement quantity

Contains the measurement quantity information for a traffic volume measurement.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Measurement quantity	MP		Enumerated( RLC buffer payload, Average RLC buffer payload, Variance of RLC buffer payload)	<del>The use of this parameter is described in subclause 8.6.7.10. This parameter should be ignored.</del>
Time Interval to take an average or a variance	CV-A/V		Integer(20, 40, ..260, by steps of 20)	In ms

Condition	Explanation
A/V	This IE is mandatory present when "Average RLC buffer" or "Variance of RLC buffer payload" is chosen and not needed otherwise.

### 10.3.7.72 Traffic volume measurement reporting criteria

Contains the measurement reporting criteria information for a traffic volume measurement.

Event 4a: Transport Channel Traffic Volume [15] exceeds an absolute threshold.

Event 4b: Transport Channel Traffic Volume [15] becomes smaller than an absolute threshold.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Parameters sent for each transport channel	OP	1 to <maxTrCH >		This IE is always required, need is OP to align with ASN.1
>Uplink transport channel type	OP		Enumerated(DCH,RACHorCPCH,USCH)	USCH is TDD only. CPCH is FDD only. RACHorCPCH is the currently configured default in the uplink.
>UL Transport Channel ID	CV-UL-DCH/USCH		Transport channel identity 10.3.5.18	
>Parameters required for each Event	OP	1 to <maxMeaspaerEvent >		
>>Traffic volume event identity	MP		Traffic volume event identity 10.3.7.66	
>>Reporting Threshold	MP		Enumerated(8,16,32,64,128,256,512,1024,2K,3K,4K,6K,8K,12K,16K,24K,32K,48K,64K,96K,128K,192K,256K,384K,512K,768K)	Threshold in bytes And N Kbytes = N*1024 bytes
>>Time to trigger	OP		Time to trigger 10.3.7.64	Indicates the period of time between the timing of event detection and the timing of sending Measurement Report. Time in ms
>>Pending time after trigger	OP		Integer(250, 500, 1000, 2000, 4000, 8000, 16000)	Indicates the period of time during which it is forbidden to send any new measurement reports with the same Traffic volume event identity even if the triggering condition is fulfilled. Time in milliseconds
>>Tx interruption after trigger	OP		Integer (250, 500, 1000, 2000, 4000, 8000, 16000)	Time in milliseconds. Indicates how long the UE shall block DTCH transmissions on the RACH after a measurement report is triggered.

Condition	Explanation
UL-DCH/USCH	If IE "Uplink transport channel type" is equal to "DCH" or "USCH" (TDD only) this IE is optional. Otherwise the IE is not needed.

### 10.3.10 Multiplicity values and type constraint values

The following table includes constants that are either used as multi bounds (name starting with "max") or as high or low value in a type specification (name starting with "lo" or "hi"). Constants are specified only for values appearing more than once in the RRC specification. In case a constant is related to one or more other constants, an expression is included in the "value" column instead of the actual value.

Constant	Explanation	Value
<b>CN information</b>		
maxCNdomains	Maximum number of CN domains	4
<b>UTRAN mobility information</b>		
maxRAT	Maximum number of Radio Access Technologies	maxOtherRAT + 1
maxOtherRAT	Maximum number of other Radio Access Technologies	15
maxURA	Maximum number of URAs in a cell	8
maxInterSysMessages	Maximum number of Inter System Messages	4
maxRABsetup	Maximum number of RABs to be established	16
<b>UE information</b>		
maxtransactions	Maximum number of parallel RRC transactions in downlink	25
maxPDCPalgoType	Maximum number of PDCP algorithm types	8
maxDRACclasses	Maximum number of UE classes which would require different DRAC parameters	8
MaxFreqBandsFDD	Maximum number of frequency bands supported by the UE as defined in [21]	8
MaxFreqBandsTDD	Maximum number of frequency bands supported by the UE as defined in [22]	4
MaxFreqBandsGSM	Maximum number of frequency bands supported by the UE as defined in [45]	16
maxPage1	Number of UEs paged in the Paging Type 1 message	8
MaxSystemCapability	Maximum number of system specific capabilities that can be requested in one message.	16
<b>RB information</b>		
MaxPredefConfig	Maximum number of predefined configurations	16
MaxRB	Maximum number of RBs	32
MaxSRBsetup	Maximum number of signalling RBs to be established	8
MaxRBperRAB	Maximum number of RBs per RAB	8
MaxRBallRABs	Maximum number of non signalling RBs	27
MaxRBMuxOptions	Maximum number of RB multiplexing options	8
MaxLoCHperRLC	Maximum number of logical channels per RLC entity	2
<b>TrCH information</b>		
MaxTrCH	Maximum number of transport channels used in one direction (UL or DL)	32
MaxTrCHpreconf	Maximum number of preconfigured Transport channels, per direction	16
MaxCCTrCH	Maximum number of CCTrCHs	8
MaxTF	Maximum number of different transport formats that can be included in the Transport format set for one transport channel	32
maxTF-CPCH	Maximum number of TFs in a CPCH set	16
MaxTFC	Maximum number of Transport Format Combinations	1024
maxTFCI-1-Combs	Maximum number of TFCI (field 1) combinations	512
maxTFCI-2-Combs	Maximum number of TFCI (field 2) combinations	512
maxCPCHsets	Maximum number of CPCH sets per cell	16
maxSIBperMsg	Maximum number of complete system information blocks per SYSTEM INFORMATION message	16
maxSIB	Maximum number of references to other system information blocks.	32
maxSIB-FACH	Maximum number of references to system information blocks on the FACH	8
<b>PhyCH information</b>		
maxPCPCH-APsubCH	Maximum number of available sub-channels for AP signature on PCPCH	12
maxPCPCH-CDsubCH	Maximum number of available sub-channels for CD signature on PCPCH	12
maxPCPCH-APsig	Maximum number of available signatures for AP on PCPCH	16

Constant	Explanation	Value
maxPCPCH-CDsig	Maximum number of available signatures for CD on PCPCH	16
maxAC	Maximum number of access classes	16
maxASC	Maximum number of access service classes	8
maxASCmap	Maximum number of access class to access service classes mappings	7
maxASCpersist	Maximum number of access service classes for which persistence scaling factors are specified	6
maxPRACH	Maximum number of PRACHs in a cell	16
maxFACHPCH	Maximum number of FACHs and PCHs mapped onto one secondary CCPCHs	8
maxRL	Maximum number of radio links	8
maxSCCPCH	Maximum number of secondary CCPCHs per cell	16
maxDPDCH-UL	Maximum number of DPDCHs per cell	6
maxDPCH-DLchan	Maximum number of channelisation codes used for DL DPCH	8
maxPUSCH	Maximum number of PUSCHs	(8)
maxPDSCH	Maximum number of PDSCHs	8
maxPDSCHcodes	Maximum number of codes for PDSCH	16
maxPDSCH-TFCIgroups	Maximum number of TFCI groups for PDSCH	256
maxPDSCHcodeGroups	Maximum number of code groups for PDSCH	256
maxPCPCHs	Maximum number of PCPCH channels in a CPCH Set	64
maxPCPCH-SF	Maximum number of available SFs on PCPCH	7
maxTS	Maximum number of timeslots used in one direction (UL or DL)	14
hiPUSCHidentities	Maximum number of PUSCH Identities	64
hiPDSCHidentities	Maximum number of PDSCH Identities	64
<b>Measurement information</b>		
maxTGPS	Maximum number of transmission gap pattern sequences	6
maxAdditionalMeas	Maximum number of additional measurements for a given measurement identity	4
maxMeasEvent	Maximum number of events that can be listed in measurement reporting criteria	8
MaxMeasParEvent	Maximum number of measurement parameters (e.g. thresholds) per event	2
maxMeasIntervals	Maximum number of intervals that define the mapping function between the measurements for the cell quality Q of a cell and the representing quality value	1
maxCellMeas	Maximum number of cells to measure	32
maxReportedGSMCells	Maximum number of GSM cells to be reported	6
maxFreq	Maximum number of frequencies to measure	8
maxSat	Maximum number of satellites to measure	16
HiRM	Maximum number that could be set as rate matching attribute for a transport channel	256
<b>Frequency information</b>		
maxFDDFreqList	Maximum number of FDD carrier frequencies to be stored in USIM	4
maxTDDFreqList	Maximum number of TDD carrier frequencies to be stored in USIM	4
maxFDDFreqCellList	Maximum number of neighbouring FDD cells to be stored in USIM	32
maxTDDFreqCellList	Maximum number of neighbouring TDD cells to be stored in USIM	32
maxGSMCellList	Maximum number of GSM cells to be stored in USIM	32
<b>Other information</b>		
maxNumGSMFreqRanges	Maximum number of GSM Frequency Ranges to store	32
maxNumFDDFreqs	Maximum number of FDD centre frequencies to store	8
maxNumTDDFreqs	Maximum number of TDD centre frequencies to store	8
maxNumCDMA200Freqs	Maximum number of CDMA2000 centre frequencies to store	8

## 14.4 Traffic Volume Measurements

### 14.4.1 Traffic Volume Measurement Quantity

Traffic volume measurements may be configured by RRC to assist with dynamic radio bearer control. The reported quantities that can be configured are:

- 1 Buffer Occupancy.
- 2 Average of Buffer Occupancy.
- 3 Variance of Buffer Occupancy.

A description of these values can be found in [15].

When a report is triggered, the UE shall provide the requested quantities for the acknowledged and unacknowledged mode RBs mapped onto the transport channels identified.

~~In order to support a large variation of bit rates and RLC buffer size capabilities, a non-linear scale is used. Since, for each RB, the expected traffic includes both new and retransmitted RLC PDUs and potentially existing Control PDUs, all these should be included in the Buffer Occupancy measure. It should also be noted that traffic volume measurements are only applicable for acknowledged and unacknowledged mode.~~

~~According to what is stated in the Measurement Control message, the UE should support reporting of RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload for RBs multiplexed onto the same Transport channel. The Reporting Quantities (i.e. RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload of each RB) are indicated in the measurement control message. If Average of RLC Buffer Payload or Variance of RLC Buffer Payload is included as Reporting Quantity, the time interval to take an average or a variance shall be used. When the RLC buffer payload, Average of RLC buffer payload or Variance of RLC buffer payload is reported, the measured quantity shall be rounded upwards to the closest higher value possible to report.~~

### 14.4.2 Traffic Volume reporting triggers

~~Traffic volume measurement reports can be reported-triggered using~~ in two different ways/mechanisms, periodical and event triggered. The reporting criteria are specified in the measurement control message.

~~For periodical reporting the UE simply determines the Reporting Quantities in number of bytes for each RB mapped onto the indicated transport channels and reports the results at the time interval and for the number of times specified.~~

All the specified events are evaluated with respect to the Transport Channel Traffic Volume (TCTV). This quantity is equal to the sum of the Buffer Occupancy for all logical channels mapped onto a transport channel. The events on a given transport channel shall be evaluated at least at every TTI (may be more often) as described in [15].

~~For traffic volume measurements in the UE only one quantity is compared with the thresholds. This quantity is Transport Channel Traffic Volume [15] (which equals the sum of Buffer Occupancies of RBs multiplexed onto a transport channel) in number of bytes. Event triggered reporting is performed when the Transport Channel Traffic Volume exceeds an upper threshold or becomes smaller than a lower threshold. Every TTI, UE measures the Transport Channel Traffic Volume for each transport channel and compares it with the configured thresholds. If the value is out of range, the UE determines the Reporting Quantities for the RBs mapped onto that transport channel and reports the results.~~

When a traffic volume measurement is set up, the UE shall:

- 1> if the IE "report criteria" is set to "Traffic volume measurement reporting criteria", the UE shall:
  - 2> for each IE "Parameters sent for each transport channel":
    - 3> if the IE "Uplink transport channel type" is not included;; or
    - 3> if the IE "Uplink Transport Channel Type" has the value "DCH" or "USCH" and the IE "UL transport channel id" is not included, the UE shall:
      - 4> for each IE "Parameters required for each Event":

5> for each ~~configured~~ uplink transport channel on which the UE is supposed to report (see below), configure an event trigger defined by the values in the IEs “Measurement Identity”, “Traffic volume event identity”, “Reporting threshold”, “Time to trigger”, “Pending time after trigger” and “Tx Interruption after trigger”;

3> else:

4> for each IE “Parameters required for each Event”:

5> for the uplink transport channel defined by the IEs “Uplink transport channel type” and “UL transport channel id”, configure an event trigger defined by the values in the IEs “Measurement Identity”, “Traffic volume event identity”, “Reporting threshold”, “Time to trigger”, “Pending time after trigger” and “Tx Interruption after trigger”;

1> else if the IE “report criteria” is set to “Periodical reporting criteria”:

2> configure periodical triggers with period equal to the value in the IE “Reporting Interval” and with number of transmissions equal to the value in the IE “Amount of reporting” for the measurement identified by the IE “Measurement Identity”;

For each transport channel for which an event trigger has been configured, the UE shall:

1> for each event configured for this transport channel:

2> if the transport channel TCTV becomes larger than the threshold in IE “Reporting threshold”:

3> if the IE “Traffic volume event identity” has value “4a”:

4> if the IE “Time to trigger” is not present; and:

54> if there is no active Pending-time-after-trigger timer for this event is not active.;

5> if the IE “Pending time after trigger” is included, start the Pending-time-after-trigger timer for this event with the value in this IE;

5> trigger a report for the measurement identified by the IE “Measurement Identity”.

4> else:

5> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

3> else (if the IE “Traffic volume event identity” has value “4b”):

4> if the Time-to-trigger timer for this event is active:

5> stop this timer.

2> if the transport channel TCTV becomes smaller than the threshold in IE “Reporting threshold”:

3> if the IE “Traffic volume event identity” has value “4a”:

4> if the Time-to-trigger timer for this event is active:

5> stop this timer.

3> else (if the IE “Traffic volume event identity” has value “4b”):

4> if the IE “Time to trigger” is not present; and:

54> if there is no active Pending-time-after-trigger timer for this event is not active.;

5> if the IE “Pending time after trigger” is included, start the Pending-time-after-trigger timer for this event with the value in this IE;

5> trigger a report for the measurement identified by the IE “Measurement Identity”.

4> else:



5> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

When the Time-to-trigger timer for an event elapses:

1> if the Pending-time-after-trigger timer for this event is not active:

42> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

2> if the IE “Pending time after trigger” is included:

3> start the Pending-time-after-trigger timer for this event with the value in this IE;

When the Pending-time-after-trigger for an event elapses:

1> if the IE “Traffic volume event identity” has value “4a”:

2> if the transport channel TCTV is larger than the threshold in IE “Reporting threshold”:

3> if the IE “Time to trigger” is not present:

4> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

4> start the Pending-time-after-trigger timer for this event with the value in the IE “Pending time after trigger”.

3> else:

4> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

1> if the IE “Traffic volume event identity” has value “4b”:

2> if the transport channel TCTV is smaller than the threshold in IE “Reporting threshold”:

3> if the IE “Time to trigger” is not present:

4> trigger a report for the measurement identified by the IE “Measurement Identity” corresponding to this event;-

4> start the Pending-time-after-trigger timer for this event with the value in the IE “Pending time after trigger”.

3> else:

4> start the Time-to-trigger timer for this event with the value in the IE “Time to trigger”;

When a periodical trigger elapses, the UE shall:

1> trigger a report for the measurement identified by the IE “Measurement Identity”;

1> if the number of reports triggered by this periodical trigger reaches the value in the IE “Amount of reporting”:

2> disable this periodical trigger.

When a report is triggered for a given IE “Measurement Identity”, the UE shall:

1> consider the variable MEASUREMENT\_IDENTITY corresponding to this measurement identity;

1> if the report is triggered by an event trigger:

2> include the IE “Event results”;

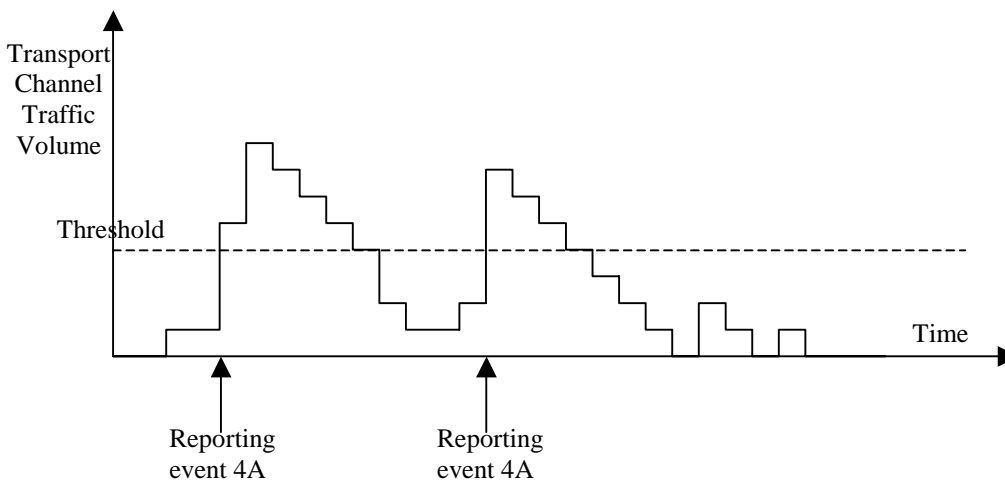
2> set the IE “Uplink transport channel type causing the event” to the type of the transport channel which triggered the report;

2> if the transport channel type is “DCH” or “USCH”:

- 3> include the IE “UL Transport Channel identity” and set it to the identity of the transport channel which triggered the report;
- 2> else:
  - 3> do not include the IE “UL Transport Channel identity”;
  - 2> set the IE “Traffic volume event identity” to the identity of the event that triggered the report;
  - 2> if the IE “Tx interruption after trigger” for the event that triggered the report is included:
    - 3> if the UE is in CELL\_FACH state:
      - 4> prohibit DTCH transmissions on the RACH;
      - 4> resume these transmissions when:
        - 5> it receives from the UTRAN a message causing the transition to CELL\_DCH state; or
        - 5> the time period indicated in the IE “Tx interruption after trigger” elapses;
- 1> if the IE “Traffic volume measurement object” is not included, the UE shall:
  - 2> report on all the uplink transport channels as specified below;
- 1> if the IE “Traffic volume measurement object” is included, the UE shall:
  - 2> report on the uplink transport channels identified in this IE as specified below;
- 1> for each UM or AM RB mapped onto a transport channel on which the UE is expected to report, the UE shall:
  - 2> add an element in the IE “Traffic volume measurement results”;
  - 2> set the value of the IE “RB Identity” to the identity of the considered radio bearer;
  - 2> if the RB is mapped onto one logical channel:
    - 3> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “RLC Buffers Payload” and set it to the Buffer Occupancy value for this logical channel, rounded up to the next allowed value;
    - 3> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “Average of RLC Buffer Payload” and set it to the Buffer Occupancy for this logical channel averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
    - 3> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
      - 4> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the Buffer Occupancy for this logical channel computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
  - 2> if the RB is mapped onto two logical channels:
    - 3> if one logical channel is mapped onto transport channels on which the UE is supposed to report:
      - 4> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
        - 5> include the IE “RLC Buffers Payload” and set it to the Buffer Occupancy value for this logical channel, rounded up to the next allowed value;
      - 4> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
        - 5> include the IE “Average of RLC Buffer Payload” and set it to the Buffer Occupancy for this logical channel averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;

- 4> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
  - 5> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the Buffer Occupancy for this logical channel computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]), rounded up to the next allowed value;
- 3> else (if both logical channels are mapped onto transport channels on which the UE is supposed to report):
  - 4> if the IE “RLC Buffer Payload for each RB” is set to TRUE:
    - 5> include the IE “RLC Buffers Payload” and set it to the sum of the Buffer Occupancy values for the two logical channels, rounded up to the next allowed value;
  - 4> if the IE “Average of RLC Buffer Payload for each RB” is set to TRUE:
    - 5> include the IE “Average of RLC Buffer Payload” and set it to the sum of the Buffer Occupancy for the two logical channels averaged over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]) and rounded up to the next allowed value;
  - 4> if the IE “Variance of RLC Buffer Payload for each RB” is set to TRUE:
    - 5> include the IE “Variance of RLC Buffer Payload” and set it to the variance of the sum of the Buffer Occupancy for the two logical channels, computed over the interval specified in the IE “Time Interval to take an average or a variance” (see [15]) and rounded up to the next allowed value;

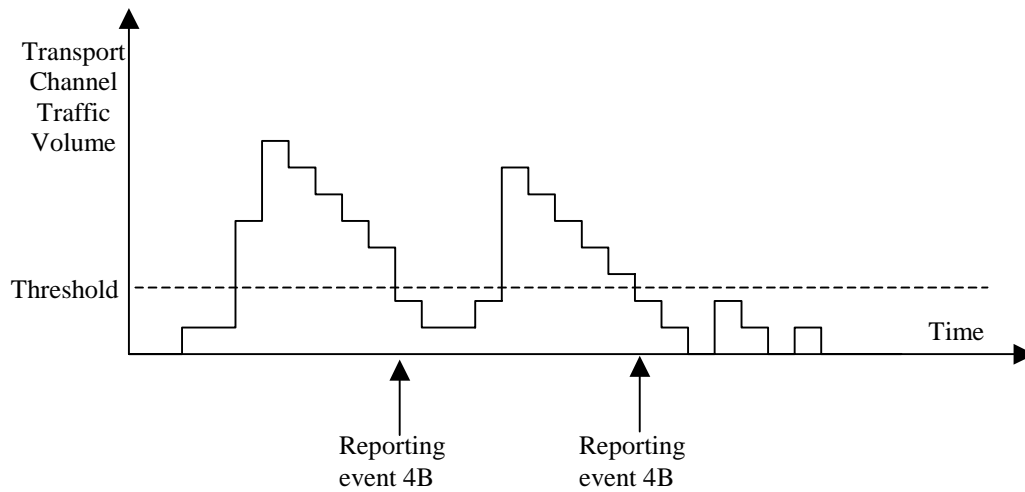
14.4.2.1 Reporting event 4 A: Transport Channel Traffic Volume ~~exceeds~~ becomes larger than an absolute threshold



**Figure 14.4.2.1-1: Event triggered report when Transport Channel Traffic Volume ~~exceeds~~ becomes larger than a certain threshold**

If the monitored Transport Channel Traffic Volume [15] ~~exceeds~~ becomes larger than an absolute threshold, i.e. if  $TCTVF > \text{Reporting threshold}$ , this is an event that could trigger a report. The corresponding report specifies at least which measurement ID the event that triggered the report belongs to.

#### 14.4.2.2 Reporting event 4 B: Transport Channel Traffic Volume becomes smaller than an absolute threshold



**Figure 14.4.2-1-2: Event triggered report when Transport Channel Traffic Volume becomes smaller than certain threshold**

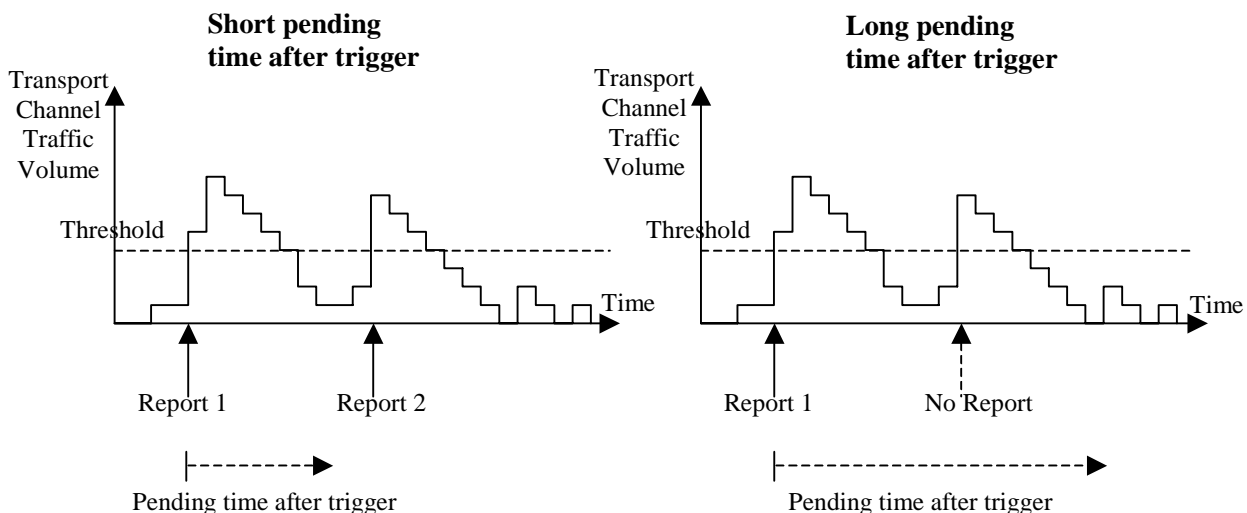
If the monitored Transport Channel Traffic Volume [15] becomes smaller than an absolute threshold, i.e. if  $TCTVF < \text{Reporting threshold}$ , this is an event that could trigger a report. The corresponding report specifies at least which measurement ID the event that triggered the report belongs to.

### 14.4.3 Traffic volume reporting mechanisms

Traffic volume measurement triggering could be associated with both a *time-to-trigger* and a *pending time after trigger*. The time-to-trigger is used to get time domain hysteresis, i.e. the condition must be fulfilled during the time-to-trigger time before a report is sent. Pending time after trigger is used to limit consecutive reports when one traffic volume measurement report already has been sent. This is described in detail below.

#### 14.4.3.1 Pending time after trigger

This timer is started in the UE when a measurement report has been triggered by a given event. The UE is then forbidden to send any new measurement reports with the same measurement ID triggered by the same event during this time period even when the triggering condition is fulfilled again. Instead the UE waits until the timer has suspended expired. If the Transport Channel Traffic Volume [15] is still above the threshold for event 4a, or below the threshold for event 4b when the timer has expired, the UE sends a new measurement report, and the timer is restarted. Otherwise it waits for a new triggering.

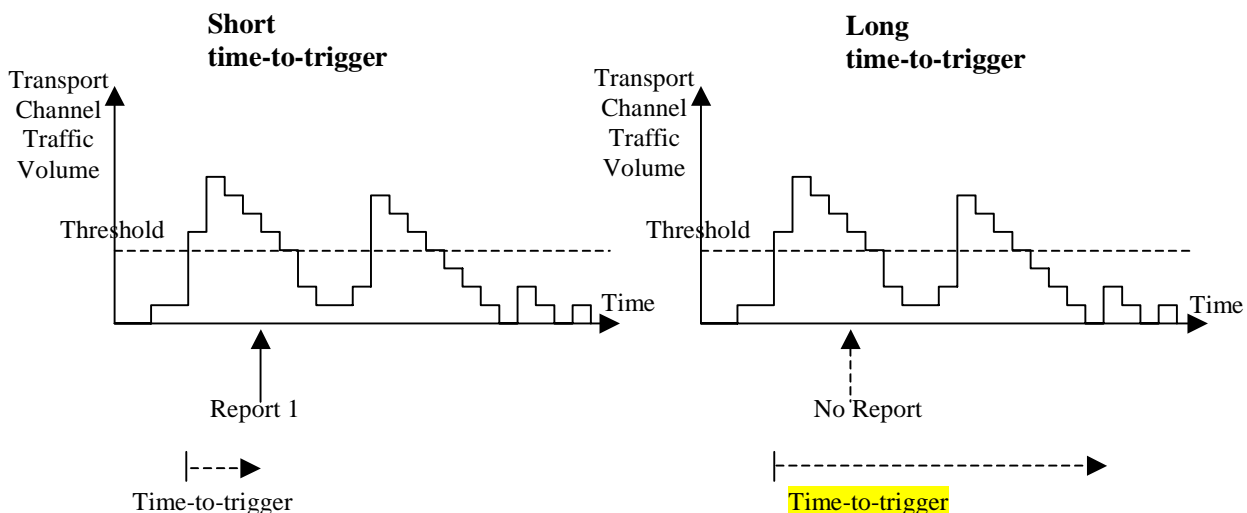


**Figure 14.4.3.1-1: Pending time after trigger limits the amount of consecutive measurement reports**

Figure 14.4.3.1-1 shows that by increasing the pending time after trigger a triggered second event does not result in a measurement report.

### 14.4.3.x Time-to-trigger

The timer is started in the UE when the Transport Channel Traffic Volume triggers the event. If the TCTV does not cross the threshold before the timer expires, ~~a report~~ the timer is stopped. If the timer expires then a report is triggered.



**Figure 14.4.3.1-2: Time-to-trigger is used to achieve time hysteresis**

Figure 14.4.3.1-2 shows that by increasing the time-to-trigger the report is not triggered.

## 14.4.4 Interruption of user data transmission

By including the IE “Tx Interruption after trigger”, a UE in CELL\_FACH substate may be instructed by the UTRAN to ~~cease temporarily prohibit~~ transmission of user data on the RACH after a measurement report has been triggered. ~~Before~~ The UE shall only resume the transmission of user data, when:

- 1> ~~the UE shall~~ it receives from the UTRAN either a message allocating a dedicated physical channel, and ~~make~~ ~~leading to the~~ transition to CELL\_DCH state; or
- 1> ~~the UE shall~~ the time period indicated by the IE “Tx Interruption after trigger” elapses, ~~receive an individually assigned measurement control message indicating that interruption of user data transmission is not be applied.~~

The transmission of signalling messages on the signalling radio bearers shall not be interrupted.