

**Agenda Item:** 15.1 and 16.1

**Source:** Ericsson

**Title:** Measurements to be provided in Node B

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## **1. Introduction**

There are several measurements that a Node B has to perform, in order to support different radio network functions. A general measurement concept has been accepted in TSG RAN WG3 to support this. This contribution aims to provide more detailed information about which measurements that should be supported.

Note that it is our understanding that:

- TSG RAN WG2 specifies which measurements that are needed from the physical layer [25.302].
- TSG RAN WG1 specifies how these measurements should be performed [25.231].
- TSG RAN WG4 specifies the performance requirements on these measurements [25.103].
- TSG RAN WG3 specifies the UTRAN support for the transport of the Node B related measurements [25.423 and 25.433].

Therefore, this contribution does not motivate the necessity of the physical layer measurements, as this has already been discussed in TSG RAN WG2.

## **2. Measurements to be performed in Node B**

### **2.1 Services Provided by the Physical Layer as defined by TSG RAN WG2**

TSG RAN WG2 have defined measurement entities to be provided by the physical layer [25.302]. The measurements that are performed in Node B are shown in Table 1.

**Table 1 : Measurements Provided by the physical layer in Node B**

<b>Measurement</b>	<b>Reference [25.302]</b>	<b>Reporting Trigger [25.302]</b>
Total Tx Power	Section 9.1.12	On-demand, periodic, Event-triggered
Code Tx Power	Section 9.1.13	On-demand, periodic, Event-triggered
UL Load	Section 9.2.1	On-demand, periodic, Event-triggered
Transport Channel BLER	Section 9.2.3	On-demand, periodic, Event-triggered
Physical Channel BER	Section 9.2.4	On-demand, periodic, Event-triggered

*Note: Location Service related measurements have been left out of this contribution, as the Location Service concept is not settled.*

We propose the following mapping between the WG2 defined measurements onto the WG3 measurement concepts (Table 2):

**Table 2 : Mapping of WG2 defined measurements onto WG3 measurement concept**

Measurement	Affects Inter-face	Transport via
Total Tx Power	Iub	Common measurement
Code Tx Power	Iub / Iur	Dedicated measurement
UL Load	Iub	Common measurement
Transport Channel BLER	Iub / Iur	Can be calculated in the SRNC by monitoring the CRCOK flag in DCH Frame Protocol
Physical Channel BER	Iub / Iur	Quality Estimate field in the DCH Frame Protocol, see also [R3_922]

*Note 1: With the mapping of the Transport Channel BLER and Physical Channel BER measurements onto the DCH Frame Protocol (as proposed in Table 2) we transport all information to the SRNC. Reporting triggers related to these entities will be SRNC internal. Therefore, these measurements are not considered further in this contribution.*

*Note 2: The in [25.423 section 8.2.9] mentioned “UL RL Quality Estimate” is not included in this contribution. A contribution describing this measurement, the use of it, and how it relates to other measurements (Transport Channel BLER or Physical Channel BER) are requested.*

## 2.2 Additional (higher layer) measurements

If there is an error in the message part of the random access message, we will have a situation where the Node B have acknowledged the L1 preamble ramping (and is thus aware of that a random access message should follow). However, the Node B will not be able to detect any message, and consequently, no data frame will be sent to the RNC.

For this reason, we see a need for the following measurement within the Node B.

Measurement	Affects Inter-face	Reporting Trigger	Transport via	Definition
Un-decodable RA messages	Iub	On-demand, Periodic, Event-triggered	Common measurement	Node B reports the number of detected RA tries during a certain time interval, for which the message part was not possible to decode.

## 2.3 Reporting Triggers

So, far three different reporting triggers have been discussed in TSG RAN WG2, on demand, periodic and event-triggered. We propose the following definition of the different reporting triggers (these triggers apply for the measurements Total Tx Power, UL Load, Code Tx Power and Un-decodable RA messages):

### 2.3.1 On-Demand

<b>Name</b>	On-Demand
<b>Definition</b>	Node B shall as soon as possible respond with a measurement report containing the requested measurement. The response time should mainly depend on the time it takes to measure the entity.
<b>Additional Parameters</b>	None

### 2.3.2 Periodic

<b>Name</b>	Periodic
<b>Definition</b>	Node B shall schedule and measure the entity so that a measurement report is delivered periodically.
<b>Additional Parameters</b>	Reporting Frequency

### 2.3.3 Event-Triggered

We propose the following events (the different events are illustrated in Appendix A) for the measurements defined in Table 2:

<b>Name</b>	Event-Driven Type A
<b>Definition</b>	Node B shall report when the measured entity passes above an absolute threshold.
<b>Additional Parameters</b>	Absolute Threshold (Mandatory)

<b>Name</b>	Event-Driven Type B
<b>Definition</b>	Node B shall report when the measured entity passes beneath an absolute threshold.
<b>Additional Parameters</b>	Absolute Threshold (Mandatory)

<b>Name</b>	Event-Driven Type C
<b>Definition</b>	Node B shall report when the measured entity rises above a relative threshold within a certain time.
<b>Additional Parameters</b>	Relative Threshold (Mandatory) Rising Time (Mandatory)

<b>Name</b>	Event-Driven Type D
<b>Definition</b>	Node B shall report when the measured entity falls below a relative threshold within a certain time.
<b>Additional Parameters</b>	Relative Threshold (Mandatory) Fall Time (Mandatory)

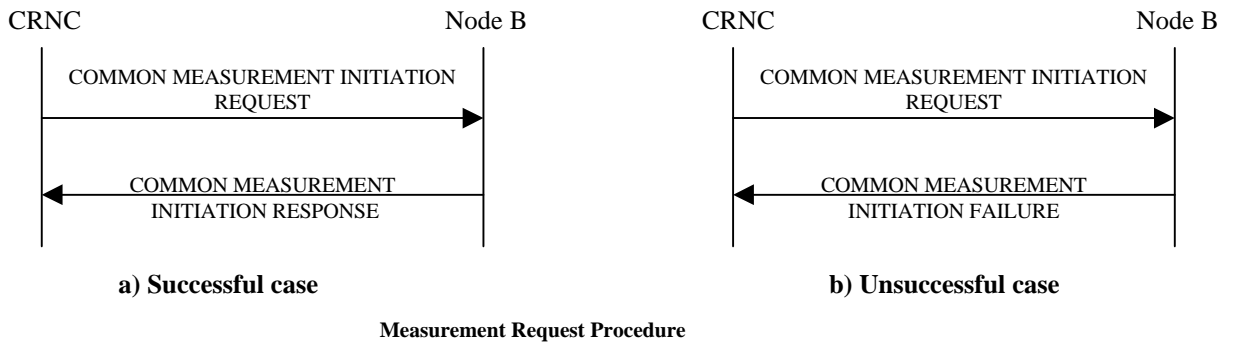
### 3. Proposals

The following subsections proposes changes to 25.433 and 25.423.

#### 3.1 Changes to 25.433 – Common Measurements

##### 8.1.4.1 Measurement Request

For requesting measurements, the RNC use the following procedure:



The COMMON MEASUREMENT INITIATION REQUEST message includes the following information:

- **Measurement Id:** This is a RNC defined identifier that uniquely identifies the measurement.
- **Measurement Object:** This defines on which resource the measurement should be performed. For example might this identifier point out a cell or a carrier within the Node B.
- **Measurement Type:** This defines what measurement that should be performed. This could for example be “~~interference on the uplink~~UL Load”, “Un-decodable RA messages~~CH frames~~“, or “~~DL Cell Power Load~~Total Tx Power“.
- **Measurement Characteristics:** This defines how the measurements should be performed. For example measurement frequency, timing information, filtering information. *The exact structure and contents of this parameter is dependent on the Measurement Type and is FFS.*
- **Report Characteristics:** The reporting could be any of the following classes:

#### On-Demand

<b>Name</b>	On-Demand
<b>Definition</b>	Node B shall as soon as possible respond with a measurement report containing the requested measurement. The response time should mainly depend on the time it takes to measure the entity.
<b>Additional Parameters</b>	None

#### Periodic

<b>Name</b>	Periodic
<b>Definition</b>	Node B shall schedule and measure the entity so that a measurement report is delivered periodically.
<b>Additional Parameters</b>	Reporting Frequency

#### Event-Triggered

<b>Name</b>	Event-Driven Type A
<b>Definition</b>	Node B shall report when the measured entity passes above an absolute threshold.

<b><u>Additional Parameters</u></b>	<u>Absolute Threshold (Mandatory)</u>
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<b><u>Name</u></b>	<u>Event-Driven Type B</u>
<b><u>Definition</u></b>	<u>Node B shall report when the measured entity passes beneath an absolute threshold.</u>
<b><u>Additional Parameters</u></b>	<u>Absolute Threshold (Mandatory)</u>

<b><u>Name</u></b>	<u>Event-Driven Type C</u>
<b><u>Definition</u></b>	<u>Node B shall report when the measured entity rises above a relative threshold within a certain time.</u>
<b><u>Additional Parameters</u></b>	<u>Relative Threshold (Mandatory)</u> <u>Rising Time (Mandatory)</u>

<b><u>Name</u></b>	<u>Event-Driven Type D</u>
<b><u>Definition</u></b>	<u>Node B shall report when the measured entity falls below a relative threshold within a certain time.</u>
<b><u>Additional Parameters</u></b>	<u>Relative Threshold (Mandatory)</u> <u>Fall Time (Mandatory)</u>

- **Periodic:** Reports should be delivered in a periodic matter with some frequency. In this case the update frequency have to be specified.
- **Event Triggered:** Reports should be delivered upon a specific event in Node B e.g Performance threshold crossing. In this case the event have to be specified.
- **Immediate Reporting:** A report should be delivered immediately. Only one measurement report should be sent and after that the measurement is automatically cancelled.

The possibility to request several measurements for the same event is FFS.

### **9.1.18 COMMON MEASUREMENT INITIATION REQUEST**

<b><u>Information Element</u></b>	<b><u>Reference</u></b>	<b><u>Type</u></b>
<u>Message Discriminator</u>		<u>M</u>
<u>Message Type</u>		<u>M</u>
<u>Transaction ID</u>		<u>M</u>
<u>Measurement ID</u>		<u>M</u>
<u>Measurement Object</u>		<u>M</u>
<u>Measurement Type</u>		<u>M</u>
<u>Measurement Characteristic</u>		<u>M</u>
<b><u>Report Characteristics</u></b> <sup>1</sup>		<u>M</u>

<sup>1</sup> Can be periodic, event triggered or immediate.

<b>On-Demand</b>		<b>C1</b>	
<b>Periodic</b>		<b>C1</b>	
Report Frequency		<b>M</b>	
<b>Event-Triggered</b>		<b>C1</b>	
<b>Event-Triggered Type A</b>		<b>C2</b>	
Absolute Threshold		<b>M</b>	
<b>Event-Triggered Type B</b>		<b>C2</b>	
Absolute Threshold		<b>M</b>	
<b>Event-Triggered Type C</b>		<b>C2</b>	
Relative Threshold		<b>M</b>	
Rising Time		<b>M</b>	
<b>Event-Triggered Type D</b>		<b>C2</b>	
Relative Threshold		<b>M</b>	
Fall Time		<b>M</b>	

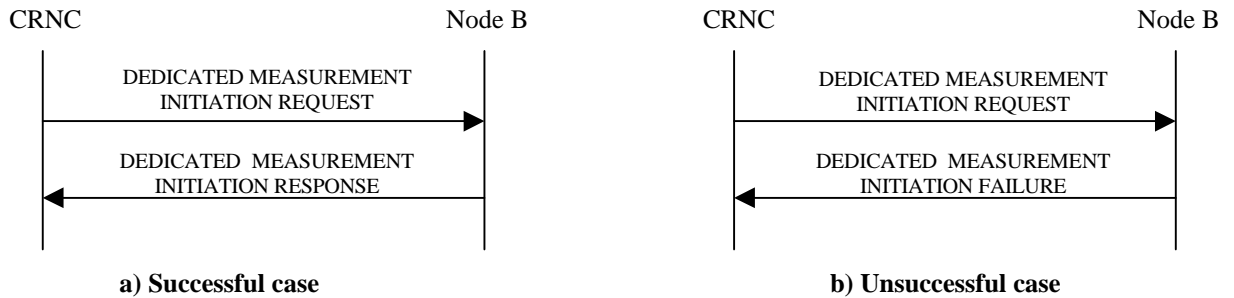
C1 : One and only one of On-Demand, Periodic and Event-Triggered can be present at the same time.

C2: One and only one of Event A to Event D can be present at the same time.

## 3.2 Changes to 25.433 - Dedicated Measurements

### 8.2.6.1 Measurement Request

For requesting measurements, the RNC use the following procedure:



#### Measurement Request Procedure

The DEDICATED MEASUREMENT INITIATION REQUEST message includes the following information:

**Measurement Id:** This is a RNC defined identifier that uniquely identifies the measurement.

**Measurement Object:** This defines on which resource the measurement should be performed. For example might this identifier point out a radio link. *Other measurement objects are FFS.*

**Measurement Type:** This defines what measurement that should be performed. This could for example be "~~used power on the downlink~~Code Tx Power". *Other measurement types are FFS.*

**Measurement Characteristics:** This defines how the measurements should be performed. For example measurement frequency, timing information, and filtering information. *The exact structure and contents of this parameter is dependent on the Measurement Type and is FFS.*

**Report Characteristics:** The reporting could be any of the following classes:

#### On-Demand

<b>Name</b>	On-Demand
<b>Definition</b>	Node B shall as soon as possible respond with a measurement report containing the requested measurement. The response time should mainly depend on the time it takes to measure the entity.
<b>Additional Parameters</b>	None

#### Periodic

<b>Name</b>	Periodic
<b>Definition</b>	Node B shall schedule and measure the entity so that a measurement report is delivered periodically.

<u>Additional Parameters</u>	<u>Reporting Frequency</u>
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**Event-Triggered**

<u>Name</u>	<u>Event-Driven Type A</u>
<u>Definition</u>	<u>Node B shall report when the measured entity passes above an absolute threshold.</u>
<u>Additional Parameters</u>	<u>Absolute Threshold (Mandatory)</u>

<u>Name</u>	<u>Event-Driven Type B</u>
<u>Definition</u>	<u>Node B shall report when the measured entity passes beneath an absolute threshold.</u>
<u>Additional Parameters</u>	<u>Absolute Threshold (Mandatory)</u>

<u>Name</u>	<u>Event-Driven Type C</u>
<u>Definition</u>	<u>Node B shall report when the measured entity rises above a relative threshold within a certain time.</u>
<u>Additional Parameters</u>	<u>Relative Threshold (Mandatory)</u> <u>Rising Time (Mandatory)</u>

<u>Name</u>	<u>Event-Driven Type D</u>
<u>Definition</u>	<u>Node B shall report when the measured entity falls below a relative threshold within a certain time.</u>
<u>Additional Parameters</u>	<u>Relative Threshold (Mandatory)</u> <u>Fall Time (Mandatory)</u>

~~**Periodic:** Reports should be delivered in a periodic matter with some frequency. In this case the update frequency have to be specified.~~

~~**Event Triggered:** Reports should be delivered upon a specific event in Node B. In this case the event have to be specified.~~

~~**Immediate Reporting:** A report should be delivered immediately. Only one measurement report should be sent and after that the measurement is automatically cancelled.~~

The possibility to request several measurements for the same event is FFS

**9.1.X DEDICATED MEASUREMENT INITIATION REQUEST**

<u>Information Element</u>	<u>Reference</u>	<u>Type</u>
<u>Message Discriminator</u>		<u>M</u>
<u>Message Type</u>		<u>M</u>
<u>Transaction ID</u>		<u>M</u>



Measurement ID		<u>M</u>	
Measurement Object		<u>M</u>	
Measurement Type		<u>M</u>	
Measurement Characteristic		<u>M</u>	
<b>Report Characteristics<sup>2</sup></b>		<u>M</u>	
<b><u>On-Demand</u></b>		<b><u>C1</u></b>	
<b><u>Periodic</u></b>		<b><u>C1</u></b>	
Report Frequency		<u>M</u>	
<b><u>Event-Triggered</u></b>		<b><u>C1</u></b>	
<b><u>Event-Triggered Type A</u></b>		<b><u>C2</u></b>	
Absolute Threshold		<u>M</u>	
<b><u>Event-Triggered Type B</u></b>		<b><u>C2</u></b>	
Absolute Threshold		<u>M</u>	
<b><u>Event-Triggered Type C</u></b>		<b><u>C2</u></b>	
Relative Threshold		<u>M</u>	
Rising Time		<u>M</u>	
<b><u>Event-Triggered Type D</u></b>		<b><u>C2</u></b>	
Relative Threshold		<u>M</u>	
Fall Time		<u>M</u>	

C1 : One and only one of On-Demand, Periodic and Event-Triggered can be present at the same time.

C2: One and only one of Event A to Event D can be present at the same time.

### **9.1.X DEDICATED MEASUREMENT INITIATION RESPONSE**

<b><u>Information Element</u></b>	<b><u>Reference</u></b>	<b><u>Type</u></b>	
Message Discriminator		<u>M</u>	
Message Type		<u>M</u>	

<sup>2</sup> Can be On-Demand, Periodic or Event-Triggered

Transaction ID		M	
Measurement ID <sup>3</sup>		M	

### 9.1.X DEDICATED MEASUREMENT INITIATION FAILURE

<u>Information Element</u>	<u>Reference</u>	<u>Type</u>	
Message Discriminator		M	
Message Type		M	
Transaction ID		M	
Measurement ID <sup>4</sup>		M	
Cause		O	

### 9.1.X DEDICATED MEASUREMENT TERMINATION REQUEST

<u>Information Element</u>	<u>Reference</u>	<u>Type</u>	
Message Discriminator		M	
Message Type		M	
Transaction ID		M	
Measurement ID <sup>5</sup>		M	

### 9.1.X DEDICATED MEASUREMENT FAILURE INDICATION

<u>Information Element</u>	<u>Reference</u>	<u>Type</u>	
Message Discriminator		M	
Message Type		M	
Transaction ID		M	
Measurement ID <sup>6</sup>		M	

<sup>3</sup> This is the same measurement ID as that sent in Request message.

<sup>4</sup> This is the same measurement ID as that sent in Request message.

<sup>5</sup> This is the same measurement ID as that sent in Request message.

### 9.1.X DEDICATED MEASUREMENT REPORT

<b>Information Element</b>	<b>Reference</b>	<b>Type</b>	
<u>Message Discriminator</u>		<u>M</u>	
<u>Message Type</u>		<u>M</u>	
<u>Transaction ID</u>		<u>M</u>	
<u>Measurement ID<sup>7</sup></u>		<u>M</u>	
<u>Time Reference</u>		<u>O</u>	
<u>Value</u>		<u>M</u>	

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<sup>6</sup> This is the same measurement ID as that sent in Request message.

<sup>7</sup> This is the same measurement ID as that sent in Request message

### 3.3 Proposal 2 – Changes to 25.423

#### 8.2.9 Measurement Request

For requesting measurements, the SRNC use the following procedure:

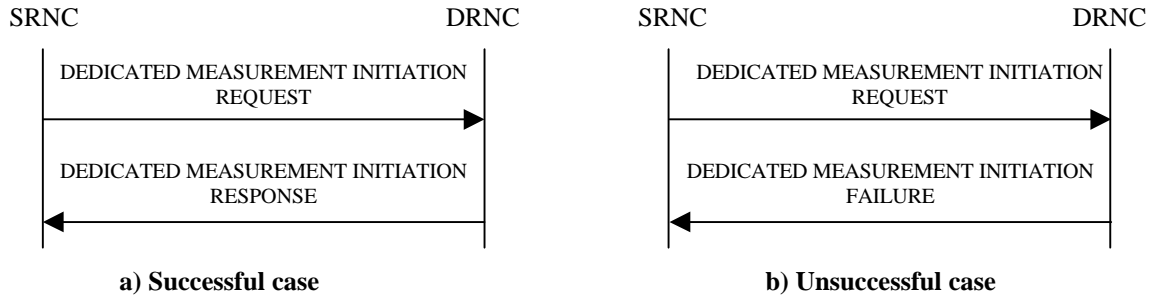


Figure 9-x: Measurement Request Procedure

The DEDICATED MEASUREMENT INITIATION REQUEST message includes the following information:

**Measurement Id:** This is a SRNC defined identifier that uniquely identifies the measurement.

**Measurement Object:** This defines on which resource the measurement should be performed. For example might this identifier point out a radio link. *Other measurement objects are FFS.*

**Measurement Type:** This defines what measurement that should be performed. This could for example be “~~used power on the downlink~~Code Tx Power” or “UL RL quality estimate”. *Other measurement types are FFS.*

**Measurement Characteristics:** This defines how the measurements should be performed. For example measurement frequency, timing information, filtering information. *The exact structure and contents of this parameter is dependent on the Measurement Type and is FFS.*

**Report Characteristics:** The reporting could be any of the following classes:

#### On-Demand

<b>Name</b>	On-Demand
<b>Definition</b>	Node B shall as soon as possible respond with a measurement report containing the requested measurement. The response time should mainly depend on the time it takes to measure the entity.
<b>Additional Parameters</b>	None

#### Periodic

<b>Name</b>	Periodic
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<b>Definition</b>	Node B shall schedule and measure the entity so that a measurement report is delivered periodically.
<b>Additional Parameters</b>	Reporting Frequency

### Event-Triggered

<b>Name</b>	Event-Driven Type A
<b>Definition</b>	Node B shall report when the measured entity passes above an absolute threshold.
<b>Additional Parameters</b>	Absolute Threshold (Mandatory)

<b>Name</b>	Event-Driven Type B
<b>Definition</b>	Node B shall report when the measured entity passes beneath an absolute threshold.
<b>Additional Parameters</b>	Absolute Threshold (Mandatory)

<b>Name</b>	Event-Driven Type C
<b>Definition</b>	Node B shall report when the measured entity rises above a relative threshold within a certain time.
<b>Additional Parameters</b>	Relative Threshold (Mandatory) Rising Time (Mandatory)

<b>Name</b>	Event-Driven Type D
<b>Definition</b>	Node B shall report when the measured entity falls below a relative threshold within a certain time.
<b>Additional Parameters</b>	Relative Threshold (Mandatory) Fall Time (Mandatory)

~~**Periodic:** Reports should be delivered in a periodic matter with some frequency. In this case the update frequency have to be specified.~~

~~**Event Triggered:** Reports should be delivered upon a specific event in Node B. In this case the event have to be specified.~~

~~**Immediate Reporting:** A report should be delivered immediately. Only one measurement report should be sent and after that the measurement is automatically cancelled.~~

*The possibility to request several measurements for the same event is FFS.*

### **9.1.26 DEDICATED MEASUREMENT INITIATION REQUEST**

Information element	Reference	Type
Message type		M
Transaction ID		M
Measurement ID		M
Measurement Object		M
Measurement Type		M

Measurement Characteristics		<u>M</u>
<b>Report Characteristics<sup>8</sup></b>		<b><u>M</u></b>
<u>On-Demand</u>		<u>C1</u>
<u>Periodic</u>		<u>C1</u>
<u>Report Frequency</u>		<u>M</u>
<u>Event-Triggered</u>		<u>C1</u>
<u>Event-Triggered Type A</u>		<u>C2</u>
<u>Absolute Threshold</u>		<u>M</u>
<u>Event-Triggered Type B</u>		<u>C2</u>
<u>Absolute Threshold</u>		<u>M</u>
<u>Event-Triggered Type C</u>		<u>C2</u>
<u>Relative Threshold</u>		<u>M</u>
<u>Rising Time</u>		<u>M</u>
<u>Event-Triggered Type D</u>		<u>C2</u>
<u>Relative Threshold</u>		<u>M</u>
<u>Fall Time</u>		<u>M</u>

C1 : One and only one of On-Demand, Periodic and Event-Triggered can be present at the same time.

C2: One and only one of Event A to Event D can be present at the same time.

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<sup>8</sup> Can be On-Demand, Periodic or Event-Triggered.

### **3.4 Changes to 25.427**

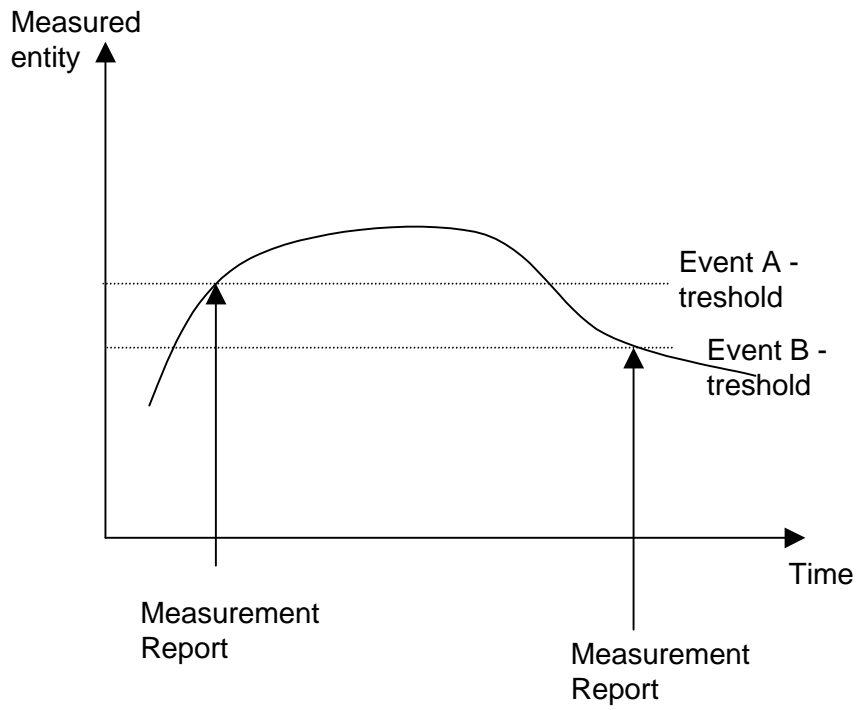
The Physical Channel BER measurement have to be included in 25.427. See [R3\_922].

## **4. References**

- [25.302] Services provided by the Physical Layer, v.2.4.0
- [25.231] Physical layer – Measurements, v.0.3.0
- [25.423] UTRAN Iur Interface RNSAP Signalling, v1.2.2
- [25.433] NBAP Specification, v.1.1.2
- [25.427] Iur/Iub User Plane Protocol for DCH Data Streams, v.0.3.1
- [R3\_922] Uplink Quality Estimate in the DCH Frame Protocol, TSG R3#6(99)922

## Appendix A – Illustration of Events

### Event A and Event B



### Event C and Event D

